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TIRAH.*

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The name Tirah is an elastic geographical expression applied to those highlands divided between the Afridi and Orakzai tribes, which lie between the Khybar and the Kuram. Tirah (or the Tirah, as it has become customary to call it) lies about midway between the two valleys; but it dominates neither, for the eastern extremity of the great Sufed Koh range and the upper reaches of the Bara valley shut it off from the Khyber, whilst the Samana range hedges it in on the south, and with other minor watersheds forms a serious obstacle to approach from the Kuram side. It is this inaccessibility which has hitherto saved Tirah from the attentions of European explorers. It is a species of *cul-de-sac*, possessing little or no strategic value, and interesting as it may have been in the field of speculative geography, its gates have hitherto been too well guarded for the explorer to do more than just look over the hedge. From time immemorial its climate and fertility have rendered it a theme of admiration to the border tribesman, whose poetic rhapsodies on its eternal verdure and its surpassing loveliness have at length been translated into the commonplace official prose of the *War Office Gazetteer*. The highlands of Tirah are now as well known as the Khyber or the Kuram valleys.

From the Sufed Koh range there strikes off in about longitude 70° 25′ a subsidiary watershed, which, running to the south-east, encloses between itself and the southern slopes of the Sufed Koh the head of the Rajgul valley, which is watered by one of the chief affluents of the Bara river. After 15 miles of this south-easterly trend it suddenly bends

* Paper read at the Royal Geographical Society, June 20, 1898. Map, p. 444.

southwards, and thenceforward divides the heads of the Bara, the Mastura, and the Khanki rivers, all of which flow eastward, from those other subsidiary streams which flow south-westward to the Kuram. The highlands to the eastward of this meridional watershed are locally known as Tirah; those to the westward, belonging to the Chamkanni, the Massozai, and other tribes, are not usually called Tirah, although in the matter of elevation and general topographical conformation they are very much the same as the eastern uplands. Of the rivers running eastward, the Bara and the Mastura unite in the midst of a network of intricate ravines near Mamani, which was for some time our advanced post on the Bara line; and the Khanki finds its way to a junction with the Meranzai stream not far from Kohat. The Tirah highlands being formed by the heads of the Bara, Mastura, and Khanki (the former being Afridi Tirah and the two latter Orakzai), it follows that any one of these rivers will give direct access to them without the intervention of any mountain pass whatsoever; and that to reach the Tirah in any other way it is necessary either to cross the meridional watershed by the Losaka or other passes which connect it with the Kuram valley, and thus enter at its head; or else to approach from either the northern or southern flank and to cross a succession of passes dividing the upper affluents of the Tirah drainage from each other. No one of these methods of approach is easy. On the contrary, they all bristle with physical difficulties, either from the altitude and roughness of the passes to be negotiated, or from the terrible defiles which beset the river routes, along which road-making even of such quality as might admit the passage of mules is a practical impossibility without an inadmissible expenditure of time and labour. In the late campaign military considerations dictated the latter course, and Tirah was approached from the southern, or Meranzai, flank. Thus the *entrée* was effected sufficiently near its head to turn all dangerous river defiles, and to drop straight into the most highly cultivated and thickly populated part of the district by the shortest possible line, which was, it may be added, the line which was most readily defensible against attack. This course involved the passage of three passes, *i.e.* the Chagru (5525 feet), near Dargai, which connects the Meranzai and Khanki valleys across the now historical Samana range; the Sanpagha (6550 feet), which leads from the Khanki to the Mastura valley (all this being within Orakzai limits); and the Arhanga (7050 feet), which dropped on its northern side into the upland called Maidán, where we first made acquaintance with the Afridi on his own uplands. None of these passes would have presented any serious obstacle to a single traveller unburdened with heavy baggage; but to the formidable array of an army corps transport —numbering from 15,000 to 20,000 baggage animals, who followed the fighting force in single file, where every shifting load or fallen animal meant the stoppage of 15 miles of transport—it is no great matter of

astonishment that they proved difficult to negotiate within reasonable limits of time. An excellent road now spans them all, and future generations of Afridis may thank us for opening out a practicable route for camel transport which will much facilitate their trade, the amount of which has been shown to be quite worth consideration.

Close under the Chagru pass, on the southern side of it, lies the post of Shinawari. A dreary little detached fort, strongly built of stone, was the original outward sign of our occupation. It overlooks the Meranzai valley from an eminence formed by a detached excrescence of one of the southern spurs of the Samana, and is only a few hundred feet above the

A CAMP IN TIRAH.

general level of the watershed which, near this point (at Kai), parts the upper and lower Meranzai valleys.

Shinawari looks down from the head of the upper Meranzai as it shelves gently westward towards Thal at the foot of the Kuram valley over scenery which is by no means unpicturesque. The gigantic mass of Dingsar shapes itself in grand outlines about 10 miles to the west, as rugged and massive a frontier landmark as may be found north of the Kuram. The lower slopes of Samana and the jagged spurs of Dingsar alike are patched with a growth of evergreens, amongst which the dark hues of the wild olive are well contrasted with the lighter sheen of low-growing scrub, including masses of dwarf palm and occasional pomegranate. In the month of October, the deep-shadowed rocks and twisted olives, backed by a vivid blue sky, are suggestive rather of the

genial temperature and climate of Italy, than of the brassy blaze of white hot summer so familiar to the frontier official. Meranzai in the late autumn is almost beautiful.

From Shinawari, a white streak curling away northward denotes the road to the Chagru pass, which has recently been cut out of the rocky sides of a convenient spur leading thereto. And here it may be remarked that all road-making has been comparatively easy. The hills rest on a core of nummulitic limestone as hard as flint, but the surface rocks are usually weather-worn, and readily amenable to pickaxe and spade.

On either side the Chagru (which lies as a depression or saddle in the Samana ridge) are the dominating peaks of Dargai and Narik Suk to the west, and of Samana Suk to the east. It was the possession of Dargai peak which gave the Orakzai such command of the pass, and the story of its capture is one which will ever live in history with certain military morals attached thereto.

From the kotal, or pass, to the Khanki valley the descent is short, and only steep for the first mile or so, the total fall to the Khanki river-bed being less than 1000 feet. It could hardly be regarded as a severely difficult pass even before road-making was effected, the exceeding narrowness of the track as it left the pass being the only cause of the terrible congestion of transport traffic which supervened on the capture of the position.

The Khanki valley offers no special attractions in the matter of scenery. The flanking mountains are ragged and rough, and unbroken by any marked peaks or fantastic outlines, such as usually give a weird sort of charm even to the most desolate frontier landscape. The long slopes of the mountain spurs gradually shape themselves downwards into terraced flats bounded by steep-sided ravines along which meander a few insignificant streams, of which the Khanki and the Kandi Mishti are the principal; and the whole scene is "washed in" with a flat tint of ochre, unrelieved by the brilliancy of continual verdure such as we find further on. On a terraced slope lying between the Khanki and the Kandi Mishti ravines, under the pass of Sanpagha, stands a mud-wall enclosed village with a grove of trees near by, and it is near this village (called Gandaki) that the road to Sanpagha runs after crossing the Kandi Mishti declivities, ere it winds its devious course up a long spur to the pass. A mile or so above Gandaki, sloping steeply up from the river-bed, there occurs a local eminence, in the centre of which was found a convenient base for the first artillery position, when the pass was captured, and this position afforded a very fine view of the pass itself. Right in front lay the brown folds of the Sanpagha spurs, one long sinuous arm stretching directly downwards to the river as if to offer a convenient line of approach to the depression on the range which marked the position of the pass. On this spur a

conspicuous rounded knoll, looking innocently unsuggestive, concealed the "sungars" from which a crowd of Orakzai defenders fled into the shadowed rifts of the mountains as the artillery shells dropped neatly into the midst of them; and on this knoll the artillery took up its second position after struggling up the steep hillsides in rear of the storming party. Here, too, after the advancing wave of attack had passed on, I found amongst the half-dried and crushed vegetation, sprinkled with fragments of shells and shreds of torn clothing, blossoms of Alpine gentian uplifting their deep blue bells to the deep blue sky.

To the right front, high up, under the lee of the ridge lay the hidden village of Nazena. This was occupied by the right attack. To the left

ROAD-MAKING.

front, balanced evenly on either side a precipitous torrent bed, and leaving much to the imagination as to possible means of intercommunication, were two villages (or the two halves of one village), called Kandi Mishti. This occupied the attention of the left attack, and was soon a grey heap of smoking ruins. The conformation of the pass and its surroundings was almost a repetition of Chagru and Dargai. A succession of steep hills in steps overhung its western flank, and afforded excellent opportunity for a plunging fire on to the road beneath. These had to be carried in succession by direct front attack.

The descent from the pass into the elevated valley of Mastura (some 1500 feet higher than the Khanki, and not so much as 700 feet below the pass) was short and comparatively easy. The difference in elevation

was at once apparent in the general appearance of the landscape; and the first view of the valley, as one rounded the last corner of the spurs enclosing the downward path, was most striking. It was not late enough in the season, even at this elevation (about 5900 feet above the sea), for apricot trees and walnuts to have parted with the glory of scarlet and yellow with which autumn had touched them; and each homestead and village piled on to mountain crag, or perched on the plateau high above the river, was embedded in colour. There were scores of such villages. Wherever a few houses were massed together in sufficient number to justify a name of their own as a separate village community, there a square-cornered but tapering tower dominated the little crowd, standing up picturesque and graceful against the sky as a Persian minar or a Florentine campanile. The beauty of the Mastura valley is the cultivated beauty of the higher Swiss valleys rather than that of Kashmir or the Himalayan Alps. Six thousand feet of elevation lifts it above the dust-begrimed atmosphere of Khanki or Meranzai, and associates it with visions of western mountain beauty.

Regretfully leaving the pretty Mastura valley by a wide upland valley which trends a little west of north, but which was seamed and intersected (as usual) by deep ravines, we soon faced the Arhanga—and the Afridis. In spite of special reports from native sources to the contrary, I doubt if the Afridis had given much previous support to the Orakzais, either at Dargai or Sanpagha; but to explain my reasons would be an inadmissible digression. It is sufficient to say here that we saw very little indeed of them at Arhanga. If they were there in any numbers, they succeeded exceedingly well in hiding themselves. Once again Nature had planted a convenient hill facing the pass from the valley below at effective artillery range. No "sangars" were observable on the pass or on the dominating peaks overlooking it, and no solid obstruction was made to our advance.

Descending about 1000 feet from the Arhanga pass to the Maidán plain (which is approximately on the same level as Mastura), the first impressions gathered of the Afridi paradise are disappointing. The picturesque beauty of Mastura is wanting, and there is no immediate prospect of smiling valleys teeming with cultivation and watered by rippling streams such as the Afridi is wont to describe when speaking of his ancestral domains. Barren, brown, and sterile hills shut in the narrow roadway, and the ultimate outlook, as one peers through the end of the defile towards Maidán, is one of further brown and barren hills, with a triangular section of dust-coloured plain at the foot of them. Nor even when one turns the corner after a mile or two of descent, and after crossing the deep-set river flanked with steep terraces, climbs up again on to the general level of the Maidán platform, does the full significance of the landscape, hachured with close-set parallel lines of field revetment, and dotted with round trees, strike one with any overwhelming

force. The Mastura valley, with its graceful watch-towers and villages, and its grey limestone cliffs broken with black blotches of olive, appeals far more to the sense of affluent beauty than does the historic "Maidán." Indeed, I have heard the latter frequently classed by the British subaltern (who is nothing if not comprehensive, and whose powers of observation are often superficial) as a "ghastly hole." Later on, the occurrence of a few ghastly incidents might have better justified the epithet; but at first it required a little careful observation to become aware of the extraordinary resources in fertility that Maidán possesses.

Maidán is an oval-shaped valley about 7 to 8 miles long and from

COMPLETED ROAD, SHOWING ALTERNATIVE LOOP.

3 to 4 miles wide, including all cultivable slopes to the foot of the surrounding hills. From these hills centuries of denudation have washed down detritus, which has collected in the centre of the valley to an unusual depth. Judging from what one could see by the sections formed in the central river-beds, there may be deposits of 100 feet of alluvium in some parts, gradually thinning out towards the edges of the basin. Ten feet of excavation, within the limits of the camps at Maidán and Bagh, revealed nothing but deep beds of rich loam, the crop-producing qualities of which must be enormous. The outlet from Maidán, through which the drainage of the valley passes to the Bara river, is exceedingly narrow, running near Datoi into a defile (locally called Khrappa, from the scrunching noise made by walking along its

pebbly bottom), and turning abruptly, almost at right angles to the length of the valley, after it has cut through the northern hills near Bagh. The heads of the main stream spread like a fan through Maidán upwards from the Bagh opening; and it is probably due to the abrupt twist that they all receive when uniting below Bagh, that the denudation of Maidán, by the conveyance of the soil in the form of silt to the Bara river, is prevented. Thus the wealth of cultivable soil in the Tirah Maidán is rather enhanced than diminished by the yearly floods. All the drainage lines converging from the rim of the oval Maidán basin on to the Bagh opening, cut deep into the slopes of the foothills, hollowing out for themselves a waterway which deepens in the centre of the valley to 200 feet or more. The sides of these waterways are precipitous and almost impassable near the hills, but as they enter the plain they are frequently let down by terraced steps for the purposes of cultivation, which renders them somewhat more easy to negotiate. Between them are long tongues of sloping plateau drooping away from the hills towards the Bagh centre. These are never very wide, but they are terraced, levelled, and dressed into the highest possible form of irrigated cultivation. Never, either in Afghanistan, Baluchistan, or Persia have I seen an equal area so highly developed as the Tirah maidán, excepting perhaps the Chardeh plain near Kabul. Every inch of cultivable ground is utilized. On the plateau above the river-beds, one looks across a seemingly level expanse of brown plain, with trees and houses scattered in irregular patches, and every apparent facility for inter-communication. Yet without carefully directing one's steps in the one possible direction, it is difficult to move for more than a few hundred yards without encountering a steep declivity, and becoming at once swallowed up by the narrow depression of a ravine-bed. Once down in the depths of these ravines, any action that might occur on the hills or plateau above was completely lost to sound and view—and the Afridis were only too well aware of this fact. To our unwary soldiers, there was every appearance of excellent cover about these lines of retreat from the hills; to the mobile Afridi, they were just the right sort of trap to hold his enemy till he could reach him from the overhanging banks.

In the late autumn, when once the yellow leaves of mulberry and walnut have disappeared, the general aspect of Tirah is that of brown sterility. The briar and rose hedgerows take on a copper hue, and in November there was all the usual appearance that the frontier assumes when about to wrap itself in its white cloak of winter snow. The delicate tracery of trees was lost in a monotonous, dust-coloured haze, so that one could hardly appreciate the numbers of them that surrounded each homestead. There are many magnificent walnut-trees, and the mulberry and apricot flourish with a true Himalayan development; there are wild olives and pomegranates on the hillsides, and the blue pine (*Pinus*

Excelsa) covers their cliff-bound summits; but on the whole Maidán is sparsely wooded, and it is a matter of surprise that so much timber is found for use in the construction of their houses. These houses are generally square-built, flat-topped, two-storeyed erections of wood and mud, which (but for the obvious necessity of importing timber from the Sufed Koh) are readily run up, and as readily destroyed. It is not worth the while of any Afridi to display a sense of superiority to the rest of his clan by any pretensions in the matter of a summer residence. His pretensions could be so very readily removed. The mullah, Saiad Akbar of Warán, had perhaps the best house that Tirah boasted. It was partly built of stone, and it was partially demolished on our first visit to his

GENERAL VIEW OF TERRACED COUNTRY.

valley; but in the short interval that elapsed between that first visit and the second (only a week or two), this house was already well on its way to restoration. At the second time of visitation not much was left of it. It is a curious fact that in a country where tribal factions are rife, where raids and counter-raids are periodic incidents, and no man can boast of a house that is more than a few years old, individuals do not collect in communities and place themselves behind walled enclosures, dominated by watch-towers, as is customary in other countries where similar idiosyncrasies prevail. But Afridi habitations exist far more generally in the form of separate homesteads than as village groups. With the first general glance over the Afridi Tirah, the eye is caught by its quaint resemblance to a city suburb teeming

with detached villas and enclosed gardens, very different indeed to the close-packed villages of the plains of India, or the walled enclosures of Afghanistan, and far more suggestive of the peaceful conditions of rural life than of a perpetual necessity for self-defence. Yet we know that there is no transfrontier district between the Arabian sea and the Black mountain where a householder has to tread more warily, or keep more constant watch and ward on his neighbours' proceedings, than in Tirah. This profusion of small homesteads and farms leads at first to an impression that Tirah must be very thickly populated; and it is also conducive to much confusion of names of localities. Every separate house or block of houses has the owner's name attached, often in addition to some local designation. Even where houses are massed in numbers sufficient to denote a village, it is the name of the headman of the community, rather than the definition of any local peculiarity such as would carry a lasting significance, that is attached thereto. Such names as Bagh, Dargai, Khrappa, Datoi, etc., which indicate topographical peculiarities, and which are likely to recur as often as the peculiarities they represent recur, are only applied to habitations when the habitations happen to fit themselves to the topographical features; and even then it will usually be found that the ruling Khan's personal name is more readily recognized than the local appellation. Bagh denotes an orchard or garden; it is a name which acquired some significance from the fact that it was at Bagh that the tribal jirgahs were held, and it figured in local reputation as a sort of capital to Maidán. But we found nothing at Bagh—nothing but a few insignificant fruit trees—to justify the name; no permanent village or bazaar, nothing to indicate the central capital of a flourishing district, beyond a flat-roofed, mud-plastered shed supported on wooden posts, on the top of which the Country Council was wont to assemble. Bagh is only a convenient central position for meeting, affording no special advantage in position to one Afridi clan more than another. In all Maidán there is no single dominating village, or town, which could be considered as a trade centre, or give commercial pre-eminence to any particular clan.

The cultivated area of the Afridi Tirah is divided between the chief clans roughly as follows: the valley of Maidán is occupied chiefly by Zakka, Malikdin, and Khambar Khel, and there are other small clans in the high valleys to the west, which are unimportant; the Waran valley, which lies to the east of Maidan and connects it with the Mastura valley, is held by Zakka and Akka; the Rajgul valley, which lies between Western Maidan and the Sufed Koh range, and which forms one principal head of the Bara (Maidan itself being the other), is inhabited by Khuki Khel; whilst lower down the Bara (after the junction of the Rajgul and Maidan drainage at Datoi), we get Kamar, Sipah, and then Zakka Khel again, and the latter spread through the Bara valley into the valleys of Bazaar and Khyber north of Bara. Thus, the Zakka possess territory which

stretches from the Orakzai Mastura on the south, right across Afridi land to the Khyber on the north. They are, therefore, the only section of the Afridis who can command a right of way from their summer headquarters in the hills to the plains of India without passing through the tribal limits of any other section, and they possess, moreover, peculiar facilities for retirement across the mountains into friendly Afghan territory, when reduced to this manœuvre by stress of circumstances. It is this fact, combined with their relative commercial strength, which gives the Zakkas a lead in the councils of the Afridi Khel, and renders them exceptionally difficult to coerce by military methods.

TERRACES IN MAIDÁN.

The difference between the system of defence adopted by the Orakzais and that of the Afridis, is indeed due to the difference of geographical position in the two countries they occupy. Both districts abound in narrow, tortuous, and precipitous defiles, flanked by boulder-covered hills, the steep slopes of which are impracticable to the untrained British soldier, and are difficult enough for native troops; but which can be traversed by the hill-bred tribesman, untrammelled by extra kit and well acquainted with every goat-track and by-path winding and twisting through the labyrinth of crag and forest, with a facility which seemed at times to be almost supernatural. In both districts there is cave-shelter to be found in the broken mountain wilderness, which might be sufficient to afford a temporary home for women and children turned out of their homesteads in the valleys by

the pressure of invasion, but it is a protection that barely shelters them from the rigors of winter—from blinding blizzards, and from sweeping snowstorms, and the mortality amongst them would inevitably be great before spring set its seal of warm vitality on the country again.

But there is this difference between the Orakzai and the Afridi Tirah. The Orakzai possess no better refuge than may be found in their own hillsides, and they must perforce capitulate when these hillsides are rendered untenable by stress of winter. The Afridi, on the other hand, has a safe harbour of refuge in the Afghan valleys to the north of his country, with an open back door, or series of back doors, through which he may retire across the Sufed Koh watershed to the lower slopes of the range where the Shinwaris dwell on the skirts of Ningrahar.

SHOWING THE SCATTERED NATURE OF THE TIRAH VILLAGES.

Here, being rich with rupees collected from Indian subsidies during many a long year of peace, he can pay for board and lodging, can plant out his wife and family, can recruit his energies, and emerge again to fight when time is called; unless, indeed, he first quarrels with his Shinwari entertainer (which would be the natural sequence of his visit) or runs out of cash. Thus, hunting the Afridi in his native wilds with an army corps is like hunting rabbits in a warren with a pack of hounds before the earths are stopped. There can be no immediate practical result. The existence of the army corps may be, however, amply justified if its moral influence makes towards the closure of those back doors, which chiefly inspire the spirit of defiance, and form the backbone of Afridi resistance.

The fighting strength of the Afridi clans has been hitherto largely

over-estimated, the basis of all estimates having been the accounts which they have rendered of themselves. Information obtained in this way is never very trustworthy, and a far surer method of calculating their strength lies in accurate measurement of their cultivable lands, and an estimate of its capacity for supporting population. By far the finest area of crop-producing soil which the Afridis possess is the upland valley of Maidán; yet the whole cultivable area of Maidán does not exceed twenty-five square miles, and it is doubtful if the Upper Warán, the Bara, Bazaar, and Kyber valleys combined could together contribute another twenty-five. It is true that this area is developed to its highest possibility for the growth of cereals (chiefly wheat) in Maidán, and of an exceptionally fine

MAIDÁN TERRACING.

quality of rice in Bara, and that it is densely populated for a trans-border district. Money has been pouring into Afridistan during twenty years of peace. Every discharged sepoy has taken home his little pile. Eighty-seven thousand rupees a year have passed through the hands of the Khyber rifles, and as much again has been paid in subsidies. This wealth has largely affected the development of agricultural interests (as well as contributed to the purchase of long-range rifles and ammunition), with the result that the Afridis may well be classed as the richest, best-armed, and possibly also the most prolific of border tribesmen; but the small extent of cultivable lands compared to the unproductive wilderness of barren hills must be reckoned with in estimating their numbers. If we put the limit of land occupation at 300 per square mile for the cultivated districts, this is probably the highest estimate permissible from such inferences as could be drawn by actually counting

villages and homesteads. This only gives us a population of 15,000, all told, for the agricultural districts; and although there may be a floating nomadic population in the hills, the estimate of whose numbers is not to be based on their visible possessions, I should doubt exceedingly if they amounted to 10,000 more. Twenty-five thousand men, women, and children will not admit of a larger contingent than 7000 or 8000 fighting men, and this I estimate to be their full strength. A large majority of these must pass through our ranks, where they learn (being an exceptionally intelligent people) a great deal more than the mere use of their weapons; and amass money enough for that consummation dear to the heart of every Afridi, the purchase of a good rifle. The experiences of the late Tirah expedition certainly did not justify any larger estimate of their numbers than that given. At Dargai there were but few Afridis opposed to us. It was essentially an Orakzai engagement. At Sanpagna and Arhanga the numbers actually seen could be reckoned in tens. In Maidán there was no single engagement in which the enemy showed *en masse;* and in Bara their numerical inferiority was denoted by the fact that they were obliged to concentrate their forces entirely on the route taken by the second division, leaving the first division to pursue its march unopposed through a labyrinth of defiles, such as might have been effectually defended by a few score men.

The character of the Afridi presents, at first sight, a problem involving such a hopeless mass of contradictions, that we must study the conditions under which the Afridi lives in his own country to account for his extraordinary idiosyncrasies and intertribal customs. Family blood-feuds, and the absence of any central autocratic authority, accounts for much in a country where every man is a law unto himself, provided he is strong enough. Thus it happens that, combined with a deadly intertribal vindictiveness which, in his eyes, justifies any sort of treachery, and an apparent total disregard of conventional forms of honour and integrity when carrying a blood-feud to its conclusion, there certainly does exist an underlying and crude, but sufficiently real, sense of honour, which will keep an Afridi true to his salt under the most aggravating conditions. As an instance of this intertribal vindictiveness, I shall never forget the determination shown by a Malikdin clansman, who was my guide in Tirah, in demanding the destruction of certain Zakka villages. He even appealed to the chief of the staff personally, when he observed that the village of a Zakka chief of some small note had been accidentally left untouched amidst the general destruction which had fallen on the country, and that it was in danger of escaping scot free.

A story was told in camp of an Afridi who was questioned as to the value of the weapons he carried, amongst which was an old and obsolete pattern of pistol, which possessed no merit beyond its power of scattering destruction at close quarters. He admitted that it was out of date, but

he added that, useless as it might be for purposes of actual warfare, he reckoned that it *was a most efficient weapon in a jirgah.** They all, however, complain bitterly of the evils which have followed the introduction of the long-range rifle into their country. Formerly, a man who was at blood-feud with his neighbour could at least till his fields by daylight, keeping one eye open to the possible chances of a shot fired within visible distance. Now, they say, it is quite impossible to tell from whence a bullet may strike, and the only safeguard is to take to agricultural pursuits by night only. Born and bred in such an atmosphere, it is no matter of surprise that an Afridi should be steeped to the chin in all the arts and wiles of tribal and domestic treachery. It is rather

HOUSES IN MAIDÁN.

astonishing that he should ever possess the soldierly quality of faith to his colours and his salt at all, and should reserve the brutalities and treacheries of his bandit existence for his own tribe and his own hearthstone. But we have had no cause to quarrel with the Afridi on this score. What he has done for us has been well done. It was an Afridi company that went to the assistance of the 35th Sikhs, on a memorable occasion when they were too closely beset by Mahmunds; and the defence of Landi Kotal, where Afridi fought against Afridi, with no intervention on the part of British officers, was quite good enough to

* A *jirgah* is a friendly meeting in council of the headmen of different clans for the purpose of discussing intertribal affairs.

warrant our faith in his allegiance so long as he is led by his recognized leaders.

The system of hereditary blood-feud, handed down from father to son, and imposed on successive generations long after the original cause for quarrel has been forgotten, or its bitterness modified by time's intervention, leads to a peculiarly open-minded condition of feeling between the Afridi and his enemy. Personal animosity seems to be wanting either in his attitude towards an hereditary individual foe, or towards a national enemy. As an instance of the former, I can recall an occasion when I was closely associated with a distinguished frontier official in Turkestan, and the nature of our investigations led us together far afield where we were much dependent on the support of our escort and servants both for our comfort and safety. The escort was small, and servants were few, and it was chiefly to our two orderlies, both Afridis, and both drawn from the same regiment, that we looked for all those various services on the road, without which we should have had anything but an easy time of it. Every frontier officer knows the value of a good orderly. They followed us from early dawn to sunset. They rode together and assisted each other in the duties of camp life. They helped each other out of difficulties. On one occasion I remember that one of them, dishevelled and soaked, was fished out of a river, where he had lost his depth, by the kindly extension of a pugri, unwound and thrown to his assistance by his brother sowar. When, in due time, our journey came to an end on the borders of India, my orderly came to me with a complaint, and the burden of his grievance was as follows: The other orderly, his Afridi relation, had had the opportunity of visiting a far-away Persian town with his master, where, with the accumulation of his regimental pay, he had purchased a most useful and far-searching rifle. I asked my friend what difference that might make to him; and he explained, with great candour, that it might make just *all* the difference. They two had yet to settle an ancient blood feud, and one of them had to die. He did not wish it to be himself if he could help it. I was obliged to regret that I could not support his bloodthirsty intentions, or recognize the necessity for arming him in such a cause, but I did not think it an altogether misplaced token of my regard for his excellent services, and my real goodwill towards the man himself, to give him a handsome present, although it could not take the form of a rifle. At the bottom of my heart I *could not help* wishing him success, he was such a good fellow. And yet I knew the other man to be a right good soldier too. It was an awkward dilemma. As for dissuading them from their intentions, such interference would have been regarded as a contemptible effort to effect a breach of Afridi honour, and I should certainly have been suspected of a spirit of meanness unsuited to an officer and a gentleman. I never saw my friend again. He has joined his fathers, and lies with

many generations of victims who have been sacrificed to a national sense of what is due to the spirits of an acrimonious ancestry. One good soldier slew the other on the first opportunity that presented itself, without animosity, and without remorse. As for their national feeling of vengeance against the British for swarming through their country, destroying their homes, and laying waste the fair places which they so love to talk about, it is perhaps best gauged by the fact that long before hostilities between us were concluded there was a demand for admission into our ranks as recruits—greater than any that had ever previously been known. The Afridi is treacherous and cruel (as we measure treachery and cruelty) by heredity and by education, but he certainly

NEAR ARHANGA PASS.

does not deserve all the hard words cast at him by McGregor and other frontier authorities. He is intelligent—by far the most intelligent of all frontier tribesmen—and compared to the loyal but obtuse Sikh, he is a man of quite monumental intellect. He will learn anything readily that he is set to learn. Afridis are not, for instance, a people bred up to horsemanship and riding, but they rapidly develop into most excellent horsemen in the ranks of our cavalry. Our teaching has turned the Afridis into soldiers who not only know the use of their weapons, but who have shown that they possess that quality the want of which has been our great security amongst the fighting hordes of Northern India, the quality of combination and the power of leading.

The Afridi is a Pathan; but what this implies; what his relations

are with the Afghan; who the Pathans themselves are; and what generally is the nature of that strip of independent territory which he inhabits together with those other turbulent tribes who have lately given us so much trouble,—all this requires a few words of explanation, which I will endeavour to render as short as is consistent with clearness.

Afghanistan, to begin with, is a name which we have applied to the kingdom ruled over by the Amir. It is not a geographical term recognized by Afghans; it means "the country occupied by Afghans." But this is not an accurate definition of Afghanistan, for that country is peopled by a conglomeration of tribes of mixed nationalities, originally drawn from nearly every corner of Asia, amongst whom the Afghans are merely the dominant race. And just as Afghanistan is not the territorial designation recognized by Afghans, neither is "Afghan" the ethnographical distinction chiefly in use amongst themselves. They call themselves "Duránis;" and, above all things, they claim to be the true Ben-i-Israel, the descendants of those people whom Nebuchadnezzar took captive and carried off from Syria to Babylon. How far ethnographical researches confirm this tradition we will not stop to inquire; but it is well to remember that the Afghan claims to be of Israelitish descent, and to be a member of the great Durani clan—the clan that once ruled an empire.

But, again, the habitat of the Afghan is not confined to Afghanistan; he occupies a very large section of that strip of independent territory, buttressed in between India and Afghanistan, which we call "independent." The Mohmands are Afghans; so are the Yusufzais of Swat and of Boner. Now, all Afghanistan and all this independent country were, about a quarter of a century ago, part and parcel of one great Durani empire. This the Afghan never forgets; and there is, consequently, the strongest possible tie of brotherhood, based on the record of a grand history, to say nothing of the ties of religion and of common language, binding together the whole Afghan community into one, whether it be located in Afghanistan or in independent territory. The Amir is still their religious chief, their Prince of Islam, their actual Durani king, whether they admit his direct control or not.

So much for the Afghan. The Pathan is simply a man who talks the Pushtu language—consequently all Afghans are Pathans; but, besides Afghans (and far outnumbering them), is all that vast collection of tribes of Indian and Central Asian extraction which inhabits, not only a large portion of Afghanistan, but a large section of our independent "buffer" states as well, and who spread even into the Peshawur and Kohat valleys, speaking the same widespread tongue, and acknowledging such affinity as community of language implies. Thus all the frontier people (including Afridis) with whom we have lately been engaged on the north-west frontier of India are Pathans; and what we have to observe is, that all the people who live in

Afghanistan, and all the people who live in this independent section of mountainous country intervening between Afghanistan and India, are bound together, first, by the strong tie of religious feeling and sympathy, and next, by community of language; whilst amongst the true Afghans (who form the dominant tribal community) there is the added tie of kinship in the Durani brotherhood, and in the faith that they are God's chosen people sprung from the seed of Abraham.

But those who have lived and moved amongst these frontier people will tell you that this bond of sympathy is by no means all-embracing; it sets most strongly in the direction where reciprocity of feeling tends to practical advantages (as is the case, indeed, all the world over), and

MOUNTAIN SCENERY, TIRAH.

that this gain of practical advantage is most obvious from the direction of Kabul. The Afridi cares no more for the interests of his Mohmand Pathan brother than he cares for those of the Esquimaux; but he cares greatly, and they all care, for the friendly backing of their great spiritual chief, even while claiming temporal independence. Should tribal *jirgahs* fall out and fight, then arbitration between them is to be sought at Kabul; should the Feringhi exhibit a tendency towards the adjustment of boundary-lines, then is intervention to be demanded from the Amir; should a too-venturesome tribal chief fall into the strait places involved by defeat and disgrace, it is to Kabul that he will resort, and there his woes will be poured forth into the attentive

ears of Kabul's king. There, too, will he usually find a safe harbour of refuge until the tyranny of the Feringhi be overpast, and he can emerge again with the view of making himself as unpleasant as circumstances admit.

Thus have the Amirs of Kabul always exercised a very real influence in these border districts, which they have never conquered, and which claim independence; and it is small wonder that, from the days of Dost Mahomed downwards, they should have secretly regarded all Pathan subjects as their own, and occasionally, with no attempt at secrecy, have asserted their claim to Peshawur itself. The British Government has, however, insisted on the independence of these tribes being a real independence by the construction of a boundary between them and Afghanistan. It has been a costly process, for our motives have been misinterpreted; but the net result is the creation of a new geographical feature in a mountainous borderland which is neither Afghanistan nor India, but which includes a great part of the province known to Afghans as Roh, containing those independent tribes (Rohillas) of whom the Waziris, the Afridis, the Mohmands, and the Swatis are amongst the chief. On the one side is the recently demarcated boundary, which is the boundary of Afghanistan; on the other is the boundary of India, which (with many important modifications) is still the boundary which we inherited from the Sikhs when we conquered the Punjaub. It is with the Afghans and Pathans generally that lie between the two that we have to deal in future, and the method of dealing with them is still a perplexing problem. Most interesting of all these tribesmen to me is the Afridi, for he is much the most advanced. He is a Pathan of Indian extraction. There are indications in his own traditions, and in his personality, which point to a Brahmanical (possibly Rajput) origin. He is distinctly wanting in fanatical fervour, and is, on the whole, but a half-hearted Mussulman, listening only to the seductive voice of the mullah when the teaching of the latter jumps with his own love of fighting. It is naturally amongst those clans that furnish the fewest recruits to our ranks, that the greatest ignorance (and consequently the greatest faith in the ignorance of their mullahs) prevails. The Zakka are pre-eminently the "wolves" of the community, and our worst enemies; and they are so regarded by the better-educated clans around them, by whom they are, as a matter of fact, detested. Even they have, however, learned the use of the long-range rifle, and know how to combine against an enemy, and it is probable that they would be able to overwhelm all the other clans put together if left in possession of their rifles, whilst others were disarmed. It is this which makes disarmament of the smaller clans impossible without impartial pressure being brought to bear all round. Between the Afridis and ourselves a good deal has been lately taught and learned. They have learned that we can make

good our right of way through any country, however difficult and however well defended. They have lost that sense of security and that moral support which the existence of well-assured means of retreat always gives to the frontier fighting man, and they have learned therewith the useful lesson not to "put their trust in princes." On the other hand, they have taught us something of the nature of that new phase of transfrontier military existence, which is rapidly developing on our borders, *i.e.* the existence of people brave and warlike (as, indeed, they have ever been), becoming daily better trained and educated in military science, armed with weapons as good as ours, and just beginning to feel their way towards military combination under experienced leadership. All this puts an entirely new complexion on our little frontier fights of the future (for we cannot disarm them), and disposes most effectually of the argument that because a quasi-police system of reprisals has answered for the last fifty years, it should answer equally well for the next fifty. Nothing stands still in the evolution of time, certainly not the military development of the Afridi, the Swati, the Bonerwhal, the Afghan, or the Wazir; and it is probable that after recent experiences even the Baluchi will understand that a small, well-armed, and well-disciplined force is not to be annihilated by a mob, however brave. If we have purchased our recent experiences in Tirah somewhat dearly, we have at least secured much matter for useful reflection. Like the man in the fable who created a tiger, we have now to consider what to do with our own creation. But that is not a geographical problem.

Just a few words about the geographical results of the recent frontier expeditions, to which the survey of Tirah was a useful contribution, although it represented but a minor part of the total out-turn. Whatever may have been the real nature of that independence on which the Rohillas (a useful ethnological term as applied to the hill men who occupy this frontier province of Roh from the Indus to the Sulimani mountains) so love to dilate, it has, at any rate, hitherto acted as a severe check on the progress of border surveys. Of Afghanistan and Persia we now know a great deal, and of Baluchistan we know everything geographical, but these borderlands immediately adjoining our own frontier have, from the Suliman hill northwards, only been approached by the surveyor under cover of a military expedition, or else have never been approached at all. Thus it happened that up to this last year of 1897 we actually knew less of that which concerned us most in our immediate neighbourhood, than we knew of those further trans-frontier countries which lay beyond the new boundary of Afghanistan. Boner, Swat, the Mohmand country, the Tochi valley, with a good slice of indefinite border country north of it, have all now delivered up their geographical secrets, besides Afridiland; and a new survey has been secured of the Khyber pass and its neighbouring hills, which was much wanted. It will be remembered that the latter was surveyed during the Afghan war by that most

energetic surveyor, Mr. G. B. Scott, who found himself more than once in hot collision with the tribes-people, and could only accomplish a rapid sketch of all the principal positions. New schemes for defence, water-supply and communications have demanded more exact surveys, and these have now been made.

It is only fair to refer to those officers who (well backed up by a contingent of native surveyors) have accomplished all this, and have effected a clean sweep of all remaining *terra incognita* that fringed the north-west border of our map of India.

In Boner and Eastern Swat, Captain C. Robertson, R.E., has made his name great as a surveyor and mountaineer, and his hereditary artistic talent (for his father was one of our best-known painters of Eastern subjects) has turned out maps which for beauty of finish will be standing examples of what can be done by a true artist even in the rough field of a campaign. Captain Robertson will certainly be heard of often in future fields. In Western Swat and the Mohmand country, as well as in the Kyber and lower Bara valleys, I was indebted to that well-known surveyor, Major Bythell, for a large extent of valuable mapping. Major Bythell is also an artist; but he, like my old friend Colonel Wahab (who assisted me on the Kuram side of Afridiland, and who has taken over my duties in India for the future), has already won his reputation in so many fields that I can add little more than my thanks to them both. Tochi was negotiated by a young staff corps officer, Lieut. Pirrie, whose only grievance seemed to be that his field of action was not quite big enough for him. However, there is a large world yet awaiting further survey developments, and there will be room in it for all his future energies. On my own personal staff in Tirah I had the invaluable services of Lieut. G. Leslie, R.E. (now Major Leslie), and of Lieut. Holdich of the Cameronians, both of whom were untried surveyors, but both showed a marvellous aptitude for the business part of the proceedings, especially when the plane-table went to the front. With their assistance on the field of action, I was able to leave much of the surveying along our line of route in the trustworthy hands of my old civil assistant, Mr. E. A. Wainright. With these officers there was, of course, associated a small but most efficient staff of native plane-tablers—mostly old soldiers, and drawn from a variety of regiments and classes, but all of them old hands at surveying and practised draftsmen. A Yusufzai Pathan and a Sikh both distinguished themselves greatly by their energy, their skill, and their daring; but it would be difficult to say that others were not almost as good as they. It was always more difficult to persuade these men to retire when the hostile Afridis closed on them whilst at work, than to ensure their obedience to any other order. The plane-table lost a foot in action, and was otherwise injured; but a kind fate preserved the surveyors throughout the campaign, and no member of the party was the worse for it.

For perhaps the first time in these frontier expeditions, the plane-tabling had to be carried on with the fighting line, and triangulation (which necessitates going far afield and visiting high places) had to be abandoned. Fortunately, previous surveys north, south, and east of Tirah had left a legacy of surrounding points which were just enough to carry us safely through our topography. The plan of action was much the same all the time we were in Tirah. With the earliest movement of any troops leaving camp on a reconnaissance in force or for foraging purposes, as the case might be, the little plane-tabling party was in the field. And here I must make my acknowledgments to that splendid body of hill workmen, the Ghurkha scouts, for they frequently safeguarded the surveyors through a difficult day's work. Careful training in the hands of their leaders, Major Lucas and Lieut. Bruce, had fitted them for work in which no untrained troops could possibly compete with them. They swarmed up the hills with all the agility of mountain cats (or Afridis), and once up, they spread out under cover right and left, and kept the Afridi sharpshooter at bay with all the science of old shikaris, and all that genial delight in the fun of the thing that only a Ghurkha betrays. Meanwhile the plane-tabler plodded away at his work behind them. When, however, the shooting gradually got closer and hotter, and there was danger of being intercepted on the return journey, the order was given for the klassie who carried the plane-table, to start. He was allowed a free run downhill in advance, to compensate for being handicapped with the instrument, and he usually went at his best pace. When he was far enough ahead, the word was passed round for the scouts to retire, and the race after the plane-table became general. I believe it was a fine sight, and I regret that personally I never participated in the movement. I believe the Afridis usually gained a little (but not much) on the Ghurkha, but the pace was too good to admit of any refined accuracy in shooting; and, so far as I am aware, the retirement to cover at the foot of the hill was always effected, if not gracefully, at least with perfect success.

Before reading the paper, the PRESIDENT said: We now have with us at last our old friend Sir Thomas Holdich, to whom I feel sure you will all give a very cordial welcome. He is going to give us an account of that region which was, I may say, discovered and explored by himself and his surveyors when serving in the Afridi Expedition under Sir William Lockhart. I may add that Sir William Lockhart himself has expressed to me his very great regret at not being able to be present this evening. I will now call upon Sir Thomas Holdich to give us his paper on Tirah.

After the reading of the paper, the following discussion took place:—

Sir JAMES HILLS-JOHNES: It is very kind of the President to ask me to pass some observations. He knows well that I have seen a little of that kind of country, but nothing to equal the very rough ground that has been gone over by Sir William Lockhart and his troops. Sir Thomas Holdich has explained to you in a very clear manner the difficulties he has had to encounter and the style of country he has gone

through, and I do not know that any words from me can be of use to further explain what he has so clearly told us about the country. He has also enlightened us as to the difficulties of the route, the absolute want of roads, and the large amount of transport that had to be taken, causing thereby the great difficulty of the campaign. I am surprised and pleased to hear that the troops did not suffer so much from cold as one supposed they would. What he has told us, that the temperature at night was hardly less than that of day at those cold and barren heights, is very remarkable. I congratulate Sir William Lockhart and the forces who have gone through that country and held up the name of the British troops in the way they have done. The native troops have shown themselves to be equal to Britishers, and I heard the lecturer say that the wonderful behaviour of the Ghurkhas was something quite extraordinary and much to be lauded. He also praised all the native troops. Of course, we expect the British troops always to do well, but those who do not know what the native troops are must be astounded at the excellent way in which they perform their duties. Left alone by themselves with native officers, they did what could hardly be expected of them to do, and I can only finish my remarks by saying that we congratulate Sir William Lockhart in having such an excellent staff and such persevering survey officers as he had—Sir Thomas Holdich and the officers under him. He informed us of the able assistance he received from the native surveyors under him, men from the native army—Afridis, Afghans, Sikhs—and I hope what he has recommended we will follow up, and that is that we should employ those men in other countries. They are men who can go where Europeans cannot go, for they need carry very little food with them, and they are hardy and well-trained men. I congratulate Sir Thomas Holdich for the excellent lecture he has given us; I am sure I have heard no better lecture in this hall.

The PRESIDENT: Sir Thomas Holdich has certainly given us a most interesting account of these valleys, which were previously quite unknown, and he has also given us much food for reflection in many ways. We should have expected that all these valleys, which lead to passes over the mountains, would have become known to us in early histories, through their having been traversed by one or other of the invaders of India. But it appears that the passes about Tirah did not attract any of them, neither Alexander, nor Mahmud of Ghazni, nor Baber, nor Ahmed Abdallah; they all selected easier routes. Of course, this is the reason why, both in native history and in the work of our surveys, these valleys have hitherto remained unknown. They will now be somewhat different from what they were before they were invaded by an English force, for English troops never go anywhere without leaving some good behind them. These valleys are now covered with excellent roads, which will certainly be used and carefully kept up by the Afridis. I think our admiration is due, as Sir James Hills-Johnes has reminded us, to Sir William Lockhart, for the admirable manner in which he conducted this campaign. He is a very old friend of mine, for I made his acquaintance more than thirty years ago, at the very time that I had the pleasure of making the acquaintance of Sir Thomas Holdich. To Sir William we owe the means which were given to Sir Thomas Holdich and his surveyors of mapping out and making us acquainted with this interesting region. We have to thank Sir Thomas Holdich for very much more than this. Ever since I have known him, he has been working in the cause of geography; and his services have been most valuable to this Society. I remember that Sir Henry Rawlinson was in this chair when Sir Thomas sent home his remarks on the Afghan campaign, he having mapped upwards of 30,000 square miles. I listened to the interesting discussion that was joined in by Sir Henry Rawlinson, Sir Henry Yule, and Sir Richard Temple. Three other valuable papers were sent to us when he was engaged on the Afghan boundary commission. The

last was read by our lamented associate, General Walker. We owe a great deal more than this to Sir Thomas Holdich, for he has kept us regularly informed of the work done in India. He has also kept us informed of the valuable services of the men who worked under him, whether natives or British, and has thus enabled us on many occasions to show our appreciation of their work; for all this the Society has to thank Sir Thomas Holdich. But we have now more especially to thank him for the admirable paper he has just read to us, and I am sure you will pass a vote of thanks to him with unanimity.

KAVIRONDO.*

By C. W. HOBLEY.

Physical.

An observer obtaining a bird's-eye view of Kavirondo from the southern slopes of Mount Elgon would essay the opinion that Kavirondo was a large flat grassy plain, only relieved by a few insignificant eminences and rocky tors. But upon descending to cross this plain, he would find that every mile or so his progress would be checked by valleys of considerable magnitude and of different degrees of steepness, each with its running stream, and each stream with its strip of boggy, reed-clad land on either bank. The country is, generally speaking, magnificently watered, for, apart from the stream in each valley, tiny springs are often found halfway up the sides of the valleys.

In the neighbourhood of the lake, however, a different condition of things prevail. A strip of country about 15 miles wide, and parallel with the shores of the lake, is characterized by extreme aridity, due to a deficient rainfall; the watercourses are dry, grass is a rarity, and the typical vegetation is of the aloe and euphorbia tribe. Nearly the only water in this region is that of the Victoria Nyanza, and on this account one is not able to explore the place with ease. In many places it was found that the villages of the natives were situated as much as 5 miles from the lake, and every second day a long string of women set out for the lake, bearing huge waterpots, to fetch this necessary of life.

In addition to the aridity, parts of Usakwa and Uyoma are frightfully stony in some places; one wonders where they find the soil wherein to plant their crops. This class of country, however, forms a very small proportion; the bulk of the country is capable of maintaining at least ten times its present population.

The district may, for present purposes, be said to be bounded on the north by Mount Elgon, to the north-west by the Elgumi country and Usoga, on the west by the Nyanza, and, working round to the eastwards, by the Surongai range, or Kabras hills, as they are popularly named. Altogether, the area at present under control may be roughly stated at

* Map, p. 444.

3000 square miles, and, as our influence gradually extends farther to the north and south, it may eventually increase to an area of 4500 square miles or more.

It is difficult to form an accurate idea of the population of the country under control, but it is roughly estimated that the population does not much exceed 200,000. The most thickly populated tract is a line roughly following the Nzoia river, a strip about 10 miles wide, running parallel with the left bank of that river.

The principal rivers are the Nzoia, the Sio, and the Lukos. The Nzoia is about 80 yards wide, with a rapid current, and a course full of huge boulders, falls, and rapids, which render it quite unnavigable; it is often fordable during the months of December, January, and February, and the remainder of the year is usually a raging torrent, which the native canoe-men often fear to cross. The Sio river, on the contrary, is a sluggish stream, placidly flowing through its mud reed-covered banks, and situated in a flat, swampy, alluvial plain; it pours into the Nyanza about one-fourth the volume of the Nzoia. About 4 miles below Mumia's the Nzoia is joined by a considerable tributary, called the Narogari, or Lusumo, which drains a large tract of country as far east as Kabras. Some 20 miles south of Mumia's there is a river which is known by the name of the Lukos, or Rukus, or Yala. This river drains a large portion of Nandi; when it reaches a spot about 8 miles from the lake it suddenly turns northward, and, within a short distance of the Nzoia river, forms a curious lake called Gangu. It then flows out of this by an obscure passage into the swampy delta of the Nzoia. Gangu lake being surrounded by a thick belt of papyrus, navigation is not easy. The average width of the Lukos at low water is from 30 to 40 yards.

Geologically speaking, nearly the whole country is composed of granitic gneiss of a rather uniform type; the usual variety is syenitic, made up of hornblende and orthoclase felspar, with but little quartz; occasionally, in Ketosh and the Nife country, beds of very indurated hornblende schist are met with. In many places surface alluvial deposits of concretionary ironstone conglomerate are seen; these, in many cases, are relics of ancient raised beaches of Lake Victoria, the iron being derived from the decomposition of the hornblende and other iron-bearing minerals in the gneiss. Mount Elgon, to the north, offers a little variety, inasmuch as it is an old volcano, and its bulk largely consists of volcanic ashes and agglomerates. It is greatly to be feared that this country will never prove productive of great mineral wealth, for an abundance of iron ore, with no coal near to work it, can hardly be said to constitute mineral riches.

The prevailing soil is rich red, of a loamy nature, with patches of black alluvial earth in the river-bottoms. Both varieties are of high fertility, and most edible vegetables and cereals, European as well as

native, appear to flourish. It is believed that the soil and climate will be found to be suited for the cultivation of coffee.

The altitude of the country varies from 3800 feet to about 5500 feet above sea-level. When an altitude of near 5000 feet is reached, as in Isukha, Tiriki, Idhako, Legolia, and Nyolo, a country of great beauty is found, a country which keeps its verdure even in the dry season; the grass, too, in many places is fine and close, and contains a considerable percentage of true clover. In the neighbourhood of Kitoto's there is a large stretch of flat alluvial country eminently adapted for rice-culture.

One great feature of Kavirondo is the marked absence of timber; there are rings of trees dotted round most of the villages, but the bulk of the country is an open treeless grass-prairie. There is a fine patch of forest at Kikelelwa, another patch about 7 miles south-east of Mumia's; the western boundary of the Nandi country is also fringed with forest. The northern part of Ketosh also contains large stretches of light timber, of no great value save for fuel. The flanks of Mount Elgon are magnificently wooded with timber of high quality; large quantities of bamboos are also found on the mountain.

Climate.

The air of Kavirondo is far drier and more bracing than that of Uganda and Usoga; the heat of the sun is greater during the day, but the nights are deliciously cool. The greatest range of temperature is during the dry season, when the early morning temperature sometimes falls as low as 55° Fahr., and the shade temperature at 2 P.M. will occasionally reach 90°. The dry season practically commences about the close of December, and continues until the middle of March. From March to December it rains with great regularity; in the afternoon of most days there occurs a rainstorm of from one to three hours' duration, accompanied by strong winds and a heavy thunderstorm; rain rarely occurs in the morning. In the year 1895 it is estimated that the rainfall was from 70 to 80 inches, but this year (1896) the rainfall has been much less, and only 59 inches fell. Seasons of drought are, however, of extreme rarity. The rains reach their maximum about August. The strip of country bounding the Nyanza, and known as Nyala, Usakwa, and Uyoma, usually has a much lower rainfall than the remainder of Kavirondo; this is probably due to the fact that the bulk of the storms coming from the east and north-east, their force is spent on the Samia and Maragolia hills, and the clouds discharge their moisture after having passed across the lower area. The area enjoying the highest rainfall is probably Ketosh, which lies immediately at the foot of Mount Elgon. The mean annual temperature at Mumia's has at present only been estimated from observations with an earth-thermometer. One observation gave us as a result 77°, and another 78·5°; we may thus provisionally state the mean temperature as 77·8° Fahr.

People.

The people of Kavirondo are far from being the homogeneous mass one might suppose in first passing through the country. There are numbers of small tribes, which may be grouped according to their origin. All the tribes may be grouped under three heads.

I. Those inhabiting the east and centre of the district belong to what is usually called the Bantu family, of which most of the South African tribes and the Swahilis are prominent examples.

II. The people to the west and fringing the shores of the lake belong to what is called the Nilotic group; that is to say, they are related to the numerous tribes which cover the large area often known as the Equatorial Province. Their nearest relations are the Shuli tribe.

III. There is a third group of tribes inhabiting the slopes of Mount Elgon and the eastern fringe of the district, of which the origin is a little obscure; they are either of Hamitic origin or belong to a separate group of Nilotic tribes to the above mentioned. A close study of their languages will, however, probably show the latter theory to be correct.

The following is a list of the tribes of Kavirondo that have come under our control up to the present:—

Bantu group.	Nilotic group.	Elgumi group, or Wamia.	Nandi group (Hamitic or Nilotic, probably latter).
Wa-Kisesa	Wa-Nife	Wa-Ugema	Wa-Lako
Marama	Samia	Kikelelwa	El-Gonyi
Mrashi	Songa	Para	Wa-Savei
Khavi or Tindi	Lego	Kimi	Mbai
Kisa	Nyala	Telemo, etc.	Sor
Ketosh	Kaki	Poto	Nyangnori
Kamuni	Timu	Seguya	Nandi
Tasoni	Sakwa	Brawa, and many others	and probably the
Kabras	Uyoma	Koko	Elgeyo
Nyoro	Milambo	Tuta	Kamasia
Nyole	Sembo and		Lumbwa, etc.
Mangali	Umia		
Legolia	Semi		
Idhako	Kami		
Isukha or Kakumega	Kajulu		
Tsoso			
Tiriki			
Kisungu			
Ioka			
Dongoi			
Muhasa, Konde, Fumba, etc., on west slope of Mount Elgon			

These tribes may be still further subdivided into groups. We will first deal with the tribes of Bantu origin:—

(1) The Wa-Kisesa include the people of Mumia, Tomia, and also

the Wa-Marama. On account of their having had more intercourse with Europeans and coast people, this tribe is the most civilized and richest in the country. The Government station, too, being situated in this district, has a great civilizing influence, as well as being a source of profit to the surrounding people.

(2) The Wa-Khavi, to the north-west of Mumia's, include the Wa-Mrashi and the people under Tindi and Ndui. They are very closely allied to the Wa-Kisesa; in fact, the Wa-Mrashi are under Mumia's rule.

(3) The Wa-Ketosh or Wa-Masawa, situated between the Nzoia river and Mount Elgon, are a numerous people, possessed of considerable pluck, great cultivators and cattle-breeders; they also pay considerable attention to banana cultivation. Their head chief is one Majanja. They are allied to the Wa-Kamuni and the Wa-Tasoni. The former are a considerable tribe inhabiting the south-west corner of the slopes of Mount Elgon, and the latter live away on the north-east boundary of Kavirondo. The Wa-Ketosh are also said to be racially allied to some of the people dwelling on the islands in the north-east corner of the Nyanza.

(4) The Wa-Kabras and Wa-Nyoro live in the eastern confines of the country, and are perhaps lower in the scale of intelligence and civilization than any of their neighbours; they are also less amenable to governing influence than most of the other tribes.

(5) The Wa-Kisa, Kusia, Nyole, Dongoi, Mangali, Legolia, Idhako, Isukha or Kakumega, Tsoso, Ioka, Kisungu are a number of closely allied tribes which inhabit the central portions of the country to the south of the river Nzoia.

(6) To the north-west of Mount Elgon, between that mountain and Busano, exist a little group of tribes which speak a dialect of the ordinary Bantu Kavirondo; there are none of them very important, but the fact is interesting, inasmuch as this is the most northerly limit of this class of language. They are skilled in banana-culture and in agriculture generally.

With regard to the tribes of Nilotic origin, we have—

(1) A group of tribes on the right bank of the Nzoia river, in and around the Samia hills; these are the Wa-Nife, Wa-Songa, Wa-Samia, and Wa-Nyala.

(2) To the south of the Nzoia, and fringing the shores of the Nyanza, are a series of tribes closely allied to the preceding ones. These are the Wa-Kaki, Timu, Lego, Sakwa, Uyoma, Sembo, Umia, Semi, Kami, Milambo, and Kajulu. Some of these tribes have rather a hard existence, their country is so arid that they are only able to raise one crop of millet in the year instead of two, as is usual in the other parts of the country. Those who live near the lake are expert fishermen, and in this way supplement their diet. The Wa-Milambo live on some

large islands in the lake, in the neighbourhood of Ugowe bay. They manufacture large quantities of salt, and this they trade up and down the whole of the east coast of the Nyanza; the salt is done up in small parcels with banana leaf, the packets being sold for one or two strings of beads or so many for a hoe.

The Wa-Kajulu are the most important people of this group. They inhabit a large strip of fertile alluvial land between the head of Ugowe bay and the Nandi escarpment; they are extremely numerous, and their chief Kitoto, although not so civilized as some of the other chiefs, is a more powerful personality in his own district than all the other Kavirondo chiefs; he claims to exercise a suzerainty over the Wa-Semi and the Wa-Uyoma. The nearest relations of these tribes are the Shuli people, who live in the country around Fatiko.

We now come to a group of tribes which inhabit the north-west portion of the district, and these may be generally classed under the heading of the Elgumi or Wamia people. They too belong to the Nile valley races, but to a slightly different stock to the foregoing. They include the Wa-Ugema, Wa-Para, Wa-Kimi, Wa-Telemo, and numerous other small tribes which live to the south-west of Mount Elgon, and the Wa-Tuta, Wa-Koko, Wa-Poto, Wa-Seguya, and Wa-Brawa, besides among other small tribes inhabiting the large area of country between the west of Elgon and the Nile, and broadly referred to as the Wa-Kedi country.

The Wa-Kikelelwa, who are now settled in the heart of the country, also belong to this class. They originally came from Ugema, in the Elgumi country, some fifty years ago, and, marching south-east, crossed the Nzoia river, and eventually settled in the forest situate some 15 miles east of Mumia's, and, once established there, they defied their surrounding neighbours. After some little trouble, they, however, followed the advice of her Majesty's Government and left their forest stronghold, settling peacefully in the surrounding open country. Through continued intercourse with the Wa-Kavirondo, of Bantu origin, they have practically adopted the language of their neighbours; numbers of the older women of this tribe wear a plug of white stone in a slit in the lower lip.

We now come to another group of tribes whose origin is not so clear; they either belong to the Nilotic or Hamitic stock. In appearance they more resemble Hamites, and they have the pastoral instincts which appear to be a characteristic of many of the Hamitic tribes; their languages, however, again contain many words of Nilotic origin, so that, under the circumstances, it will perhaps be well to avoid hasty conclusions upon the subject.

The tribes in question are the Wa-Lako, El-Gonyi, Wa-Savei, Wa-Sor, Wa-Mbai, and Wa-Nyangnori; this group also includes the Wa-Nandi, Wa-Elgeyo, Wa-Kamasia, and others not in this district.

The Wa-lako and El Gonyi live in the southern slopes of Mount Elgon, and are hospitable, friendly people. The Wa-Lako live in walled villages at the foot of the mountain, but some of their number and the El Gonyi reside in numerous caves in the lower line of cliffs. The head chief of the Wa-Lako is one Mongichi. The Wa-Savei, Wa-Sor, and Wa-Mbai live on the north side of the mountain; they live in great terror of the raiding tribes which inhabit the neighbourhood of the Salisbury and Kumama lakes, and who have not as yet been brought under our control. The Wa-Nyangnori live in a small tract of mountainous country under the Nandi escarpment, and are practically Wa-Nandi, but they are bitter enemies of the Wa-Nandi and disclaim any relationship.

It will now be well to briefly review the principal customs, etc., of the Wa-Kavirondo. On the birth of a child, a medicine man is generally called in with his drum to ensure good luck. Six days after the child is born, if it is a boy, or four days after the birth if it is a girl, the mother takes the child and places it in the road at some little distance from the village. Immediately upon her return without the child, another woman in the village goes away and picks up the child, restoring it to its mother; the woman who picked up the child thenceforth stands in the position of a godmother to the child. Upon the birth of a child, the mother allows her hair to grow until the child can walk, and then shaves her head. Great dances, etc., take place upon the occasion of the birth of twins. Among the Wa-Kisesa circumcision is practised; it is unknown among the rest of the tribes. When the child is able to speak, several of the front teeth of the lower jaw are extracted; Mumia's people extract four, the Wa-Nife six, and the Wa-Ketosh two; people who omit this rite are supposed to be unclean, or, as they express it, "the same as the flesh-eating beasts of the field."

Marriage, as amongst most African tribes, goes by purchase, and the number of wives is only limited by a man's means. The richer the man the higher the price he has to pay for a wife; a chief will pay as much as four cattle, twenty goats, and fifty hoes to the father of a girl, a poor man only five to fifteen goats. If a woman dies within a few years of her marriage, the father returns half the price paid. Each wife lives in a separate house with her children, and each has her "shamba" and her share of the cattle, sheep, and goats belonging to the husband. The men eat separately and before the women.

Upon the death of a Mkavirondo, the eldest son succeeds to the property, the chief taking one ox as a sort of succession duty; the eldest son, moreover, marries all the wives, with the exception of his mother. If there are no sons or the sons are young, then the man's eldest brother succeeds to the property and the wives. The wives that have grown-up

children are usually excepted from these laws, and live on in the village, each in her own house as usual. The Wa-Kisesa bury their dead in a recumbent position, except in the case of a chief. Upon the death of a chief, the body is placed in the ground in a sitting position, with the head above the level of the ground; an ox is killed by the side of the grave so that the blood falls into the grave, and the raw hide is placed under the body, the grave is filled in, and the projecting head covered with a large earthen pot; an elder of the village sits in vigil by the grave day and night for a month. The grave is usually situated in the hut of the deceased chief. Some years after the death of a big chief, the people of Mumia's dig up the bones, wash them with ceremony, killing oxen, etc., and then rebury the remains on the borders of Ketosh, the Wa-Kisesa having originally supposed to have come from Ketosh direction, the north-east. The Wa-Ketosh throw out their dead into the bush, but the people of Kitoto again bury. After the funeral of a deceased person, the wives form a procession, and visit the surrounding villages, carrying the spears, pipe, and stool of the deceased; the head wife is decorated with cattle-bells fastened round her waist.

When peace is made between two tribes, the alliance is ratified by the process of killing an ox and taking out the heart; this is roasted over a fire, and pieces eaten by the principals. At Kabras a different rite prevails: a dog is tied to a post, the representatives of one party hold the forepart of the animal, and those of the other party hold the hinder part; a chief or elder then takes a knife and cuts the living dog in half, at the same time addressing the assembly to the effect that any one breaking this peace will be cut in half similarly to the dog. The Wa-lako of Mongichi have a different custom: each of the parties provides a spear and an arrow; these are placed upon the ground, the blade of one spear being alongside the butt of the other one; representatives of the tribes stand on opposite sides of the weapons; they then cross over to opposite sides, stepping across the weapons, at the same time haranguing their respective followers to the effect that the arms having, as it were, been trodden underfoot, nothing but peace is to prevail. A dying chief names his successor, but the succession to the chieftainship usually follows the law of primogeniture, unless there is some special reason to the contrary.

The Wa-Kavirondo do not possess a great variety of superstitions, the most important being those which are connected with the question of weather. There are certain individuals who profess to hold the power of controlling the elements. This power is supposed to be hereditary; at the death of a rainmaker a great storm takes place, during which the supernatural power passes from the father to his eldest son. These rainmakers profess to have the power of withholding or bringing rain, and also of allocating exactly the limits within which it shall fall.

Trading upon this reputation, offerings of cattle, goats, etc., are obtained from the surrounding natives, who are naturally anxious to propitiate such powerful personages. If there was a drought of any length, it was formerly the custom to kill the rainmaker, which proceeding, it is said, never failed to produce rain.

The men are usually devoid of dress, the women wearing a small fringe of fibre before and behind. As they become more civilized a taste for cloth is rapidly growing up, and in the neighbourhood of Mumia's large numbers of both sexes are clothed.

The principal ornaments worn are beads and iron wire, which are usually worn by the women in the form of necklets, amulets, and anklets; brass wire is also worn to a slight extent. Amongst the Wa-Kisesa no man is allowed to wear brass wire except the senior chief. Sakwa was formerly the only chief among this people entitled to wear it, but since his death Mumia and Tomia are equally entitled to wear this insignia of power, one as the son of the great chief Sundu, and the other as the son of Sakwa. The Wa-Nife and Wa-Nyala are rather fond of ornament. They have a peculiar decoration of the ears: a number of perforations are made in the lobe of the ear, and a series of small leaf-shaped pieces of beaten brass are inserted and riveted over, a blue bead being attached to each of the brass leaves. They also wear, suspended across the forehead crescent-wise, the split lower canine tooth of a hippopotamus.

The tribal weapons of the Wa-Kavirondo are a pair of small-bladed spears, one for throwing, the other for close quarters; bows and arrows are also used to a slight extent, and the "simé," or spatulate sword, has been adopted from the Masai. They all carry shields of raw hide, 4 feet long by 15 inches wide, rounded at each end. The Wa-Nyala shields are nearly circular, and bent to fit round the body of the bearer; some of the South Kavirondo people carry enormous oval shields, 6 feet long.

The Wa-Kavirondo drink large quantities of beer brewed from the eleusine grain (wimbi) or from the millet; the Wa-Ketosh brew a mixture of banana and millet. The beer is generally drunk in assembly; a ring of men sit round a large jar of the beer, and each man has a long hollow flexible wand with a strainer at the lower end, and all silently suck up the liquid through the tubes; these "pombe" sticks are 7 to 8 feet long. Both sexes smoke large quantities of tobacco, and also "bhangi," or Indian hemp.

The principal occupations of the Wa-Kavirondo are cultivating, cattle-rearing, and trading. The cultivation is mostly in the hands of the women, but it is not, however, thought undignified for men to engage in agricultural work. The great object of a Mkavirondo's life is to obtain cattle, or, failing that, sheep and goats, and all his trading is but a means to this end. The principal local trading is in hoes, cattle, etc., and

ivory. The native hoe, or "jembi," is the local unit of currency; the price of ivory is quoted in head of cattle, the price of cattle in terms of so many hoes; for smaller change still, strings of beads are used. There is a considerable trade between Kavirondo and Usoga, which is a good example of the circuitous methods of native trade. A Mkavirondo of Mumia's sells goats, sheep, or hoes for brass wire, which is the usual medium of exchange for their articles; he then starts off to Usoga with his brass wire, where it is in considerable demand, and there purchases goats and sheep; the goats and sheep he takes to Samia, which is the greatest centre of the native ironworkers, and there trades them for hoes, which he brings back to Mumia's. In this way he about doubles his capital in a trip. When the hoes have accumulated to a sufficient extent, he exchanges them for cattle at the average rate of about twenty for a cow.

Ivory trading requires a capital of too many cattle for many of the people to engage in it; it is mostly in the hands of Mumia and a few others, who make a speciality of it. The bulk of the ivory comes from Elgon and Nandi, and does not represent a great amount at present.

The people of Samia, Nyala, and Ketosh are great ironworkers, smelting the iron from the native ore with charcoal, and forging hoes, spears, hatchets, knives, etc., with great skill. The Wa-Kavirondo also make pottery of a simple character, water-jars, cooking-pots, lamps for semsem oil, pipe-bowls, etc. They are also clever at wicker and basket work of different kinds; the people of Kitoto's and the Wa-Nyala also make excellent matting from the papyrus of the Nyanza.

The principal agricultural products are millet and the "batata," or sweet potato; bananas are cultivated to a large extent by the Wa-Ketosh and Wa-Lako. Eleusine, or "wimbi," is also largely grown, together with various varieties of beans, or "maharagui," as they are called. Sem-sem, or sesamum, "mahindi," or maize, various kinds of spinach, pumpkins, and castor-oil are also grown.

The great characteristic of the Wa-Kavirondo as a whole is their honesty; making war upon a neighbouring tribe to take their cattle is considered legitimate, but petty thieving is extremely rare, thus comparing very favourably with the inhabitants of Uganda and Usoga. Except at Mumia's, where they have been corrupted to a certain extent by years of intercourse with the Swahili porter, the natives are very moral in their domestic relations. They are not as a whole an exceptionally brave race, but the Wa-Ketosh and the Wa-Lako stand out high above all the others in this respect. They are an excitable people, easily given to panics and scares, and very often most ridiculous, exaggerated, and unfounded rumours pass through the country and are firmly believed by the people. At bargaining they are pertinaciously obstinate, and, sooner than reduce their price, they will carry off their

goods; they also immediately seize the opportunity afforded by a temporary period of scarcity to permanently raise the price of an article.*

British Rule.

The influence of her Majesty's Government has not been established in Kavirondo without a certain struggle. The fact of the country being split up into so many sub-tribes without any really powerful chiefs has induced a more complicated situation than would otherwise have been the case. The majority of these tribes have long-standing feuds with their neighbours, and the young men of the tribes foster these feuds in order that opportunities may present themselves of raiding cattle with which to purchase wives. In fact, a few years ago intertribal raiding was of everyday occurrence, and the first object of her Majesty's Government has been to check this raiding. Intimately connected with this raiding propensity grew up the demand for breech-loading rifles, and to obtain these certain sections of the people took to attacking passing caravans to obtain rifles and ammunition; others, again, induced men to desert and sell their arms.

These practices all tended to bring about a hostile situation. At the commencement of the year 1895 the Wa-Ketosh were in open hostility to her Majesty's Government, having massacred a party of natives in Government employ, and having on several occasions murdered friendly Wa-Kavirondo belonging to Mumia's, and refused all friendly negotiation. The Wa-Kabras and Wa-Kikelelwa also caught the spirit of disaffection, attacking passing caravans, stealing numerous rifles, and killing stray porters; they attacked the friendly people of Sakwa, and threatened to attack the Government station at Mumia's. When disaffection once appears among native tribes, it generally spreads, if not immediately checked with a firm hand, and later on in the year the Wa-Nife declared war against Mumia's people, and made repeated raids upon the outlying villages. However, as soon as a force was available, at the close of the Unyoro campaign, an expedition was dispatched against Ketosh, which inflicted a decisive blow, and upon its return from Ketosh, proceeded against the Wa-Kikelelwa, and drove them out of their forest stronghold, and at the close of these operations the Wa-Kabras came in and treated for peace. Even after all the above fighting was finished, the Wa-Nife still persisted in refusing to listen to all negotiations, and in January, 1897, an expedition passed through their country, effectually demonstrating the futility of their hostile attitude. After allowing an interval for excitement to subside, peace negotiations were again opened with Ketosh and Kikelelwa, this time attended with success, and the Wa-

* The Vocabularies collected by Mr. Hobley have been communicated to the Anthropological Institute.

Ketosh and Wa-Kikelelwa are now amongst our firmest allies. Later on the Wa-Nife sued for peace, and all is now quiet, and one advantage of the peace is that it has facilitated the opening of a short route through their country from Mumia's to Port Victoria. As an instance of the increasing influence of her Majesty's Government, it may be mentioned that, being recently in want of a large quantity of building timber, grass for thatching, etc., the surrounding chiefs were each requested to use their influence upon their people to bring in the material, and they all responded with alacrity, and brought in large quantities without any demur whatever, whereas twelve months ago they would have laughed at the proposal.

The external commerce of the district is at present rather small and unimportant. Formerly, numerous caravans of Arabs and Swahilis came up to trade for ivory, combined with a little quiet slaving, but the days of slaving and dealing in contraband are now past, and so few of these ventures turn out profitable that the Hindu merchants at the coast, who finance the Arab traders, have become chary of making advances to up-country traders.

The local price of ivory has, moreover, increased during the last few years, and traders at the present day seldom sit down here to systematically trade, but pass through to Engaboto, Turkana, etc., where ivory is still obtainable at ridiculously low prices. The recent pacification of Nandi is already bearing good effect, the trading relations between Kavirondo and that country are increasing, and the Nandi and Lumbwa ivory market will rapidly become opened up. At present the capacities of transport are taxed to the utmost to bring up Government stores, but as transport difficulties disappear and a greater variety of goods are introduced, the wants of the people will rapidly increase, and it will be realized that the vast number of cattle in the country are a source of potential wealth to the people.

The Wa-Kavirondo are more or less engrossed in their own pursuits of cultivation and the like, and are as yet strange to the idea of working for wages for an outside employer, and the absence of powerful chiefs who could use their influence to induce the people to take up regular work is a great loss. But every effort is being made to gradually initiate them to the idea of regular work, and a steadily increasing number come daily to the station for work. They strongly object to carrying heavy loads and going on caravan work, but are willing to fetch in timber, cut grass, and perform the general work of a station. It will be some time before they can be induced to go long distances from their homes, but with tact they will engage on road-making work and the like. In fact, big public works like roads and railways will do more than anything to accustom them to regular employment.

NORDENSKJÖLD'S 'PERIPLUS.'*

By C. RAYMOND BEAZLEY.

THIS volume is a continuation of Baron Nordenskjöld's Facsimile Atlas, published eight years ago; but whereas the former was devoted mainly to an examination of early printed maps, the present instalment is specially concerned with manuscript sources for the history of cartography. Like its companion, the 'Periplus' is therefore an historical atlas, with an explanatory text, which does not confine itself to elucidating the maps here given, but deals generally with the chief points in the history of Mediæval geography. As an atlas with a cartographical inquiry, it naturally traverses much of the ground covered in the great works of Santarem and Jomard, the 'Ältesten Weltkarten' of Konrad Müller, the 'Studi' of Uzielli and Amat, and similar works; as a history of geographical expansion, it often runs parallel with such surveys as we have in Peschel's 'Geschichte der Erdkunde,' or Vivien de St. Martin's 'Histoire de la Géographie.'

In the atlas proper, forming the second part of his Periplus, Baron Nordenskjöld has given us sixty sheets of maps reproduced in phototype, or photolithography, mainly from originals of the Portolano type of the fourteenth, fifteenth, and sixteenth centuries. But in the two hundred pages of accompanying text he has also given us one hundred smaller reproductions of other works of the same period, enriched, like the atlas, with numerous additions from later cartography of the seventeenth and eighteenth centuries. A few examples are added from the earlier Mediæval work, such as the Beatus and Hereford mappemondes, sketch-maps from Dati's Sphera, part of Ptolemy's and Matthew Paris's England, and a reconstruction of Skylax' (conjectural) Periplus-map.

The text itself is devoted to the following subjects: I. Greek and Roman cartography before Ptolemy. II. The Periplus of Skylax. III. Maps and sailing directions from the second century A.D. to the Crusades. IV. Portolanos (1), their characters, standard of measurement. V. Portolanos (2), comparison between the legends. VI. Portolanos (3), sources of the normal Portolano, date of its compilation, windroses, the invention of the compass. VII. Portolanos (4), the calendar-diagram, directions for tacking, degree-lines. VIII. Portolanos (5), list. IX. Printed Portolanos, sailing directions. X. Maps of the north of Europe, etc., during the "Incunabula period" of cartography. [XI. Sailing directions for the Northern Seas, by E. W. Dahlgren.] XII. Discovery and charting of the ocean coast of Africa. XIII. Mapping of the south

* A. E. Nordenskjöld, 'Periplus: an Essay on the Early History of Charts and Sailing Directions.' Translated by F. A. Bather. Stockholm, 1897.

and east coasts of Asia, with a list of Asiatic coast-charts, etc., between 1492 and 1561. XIV. America, with comparative lists of the legends on the maps of the same (1527–1546), and with a catalogue of the oldest maps of the New World. XV. The Pacific, to about 1660.

From this it will be seen how large is the field covered by this volume; the map-reproductions are on the same level of excellence as those in the Facsimile Atlas; the text gives many interesting and valuable suggestions, tending often to modify accepted views; and the printing, etc., is well worthy of the author and his subject. But, like the Facsimile Atlas, this volume, especially in its explanatory text, requires careful handling; *e.g.*—

(1) As to its general character, the 'Periplus' must be looked at rather as a collection of materials for the history of Mediæval and Renaissance geography than as a connected survey of the same. It presents us with a selection of examples, of widely differing date and character, from the mass of early cartography; it presents us also with many valuable remarks upon various points of geographical history; but it does not seem to divide up the field (as Konrad Müller, for instance, has done), and to work out, section by section, an ordered treatment of the whole, or any great part of that whole. In the splendid map-reproductions which form the second division of this volume, we may perhaps inquire why an historical or local classification has not always been employed. Why, for instance, after such an (historical) order has been followed to sheet xxxii., A.D. 1596, do we then have, after a series of World-maps and Mediterranean portolans, a North Europe (Tuondelmonte) of fifteenth century, an England (Matthew Paris) of thirteenth century, and then a West Europe (Benincasa) of 1467, a North again (sheet xxxiv.) of 1558, an East-Europe (Nic. a Casa) of 1491, a Russia, etc. (Anthony Wied), of 1555 ('70), with a succession of "Russian" maps to Strahlenberg of 1730, whose work is to some extent continued in the Asia of Gastaldi, 1561, on sheet liv., followed on sheet xxxix. by the Borgian mappemonde of c. 1450 (Baron Nordenskjöld would apparently date this about 1430); then proceeding to the Mediterranean of Gratiosus Benincasa, 1467, the Indian 'Roteiro' of John de Castro, 1538–9 and 1541; and the La Cosa map of 1500? (2) As to the part of his text specially given to the *chronicle* of geographical discovery, Baron Nordenskjöld seems often content to reproduce the *textus receptus*, as recorded, for instance, in Vivien de St. Martin, Santarem, Peschel, or Major, though with less reserve than has been shown by some of these scholars. Thus, to take a few instances, he appears to accept all the stories of the circumnavigation of Africa in classical time, most of which are unquestionably mythical. With a little more hesitation, he likewise accepts (on p. 54, modified on p. 121) the old position as to Henry the Navigator's "School" at Sagres, now so vigorously challenged.

With more justification, he grants Cadamosto's claim to the discovery of the Cape Verde islands. Far more surprising is his full acceptance of the French stories of fourteenth-century settlements on the Guinea coast by sailors from Dieppe, of the suggestion that Ptolemy's Menuthias is the Madagascar of our maps, and of the tradition that "magnetic cars were used in China more than two thousand years before our era" (p. 49, n. 4). He seems also to show at least an excessive complaisance to the Fra Mauro legends of the early fifteenth-century voyages from India, round the Cape of Good Hope, to the west coast of Africa, and to the traditional share of Martin Behaim in geographical invention (especially admitting, as he himself does on p. 122, Behaim's inaccuracy in matters of geographical history). Is it not too much to say (p. 122, n. 1) that the theory of land to the south of the Atlantic Ocean "never met with any acceptance among geographers," in the face of Ptolemy's own work, and the imitations of the strict Ptolemaic School in later time? The ten years' interval between B. Diaz' return at the end of 1487 and Da Gama's start in 1497 is ascribed wholly to the apathy and want of insight of the Portuguese, whereas it was surely due far more to the long illness and untimely death of John II. (1490–1495), who in his last days was making strenuous efforts to complete the work which Diaz had carried so far, and whose life, if it had continued without ruinous disease, would have probably witnessed the first direct voyage from Lisbon to Malabar, and back again, before the close of 1495. Too much respect, it may be thought, is shown (on p. 82) to the testimony of Solinus about the distance from the Orkneys to Thule, as there is ground for doubting that Solinus is ever an independent authority, or is ever actuated by a desire to tell the truths of nature instead of the marvels of pseudo-naturalism. A sentence on p. 139 is translated so as to allow the casual reader to suppose that Marco Polo sailed home starting from Chipangu, Zipangu, or Japan. The distinguished author seems to us unduly positive that the Laurentian Portolano of 1351, and similar works, *prove* a circumnavigation of Africa in the early fourteenth century; and he seems to take little account of the difficulties in the story of Antoniotto Uso di Mare, whom he confuses with Antonio de Nolli, meeting (in about 1460) with descendants of survivors from the Genoese expedition of 1291 in the Senegal region. The "Friar Cosmas Indicopleustes" (p. 137) is a misuse of terms which may be due to the translator, whose work does not strike us as altogether satisfactory (see on pp. 4, 81, 85, 94, 114, 118, 120, 147), but the view expressed of John de Plano Carpini (p. 138) must be the author's responsibility, and we can only express our surprise at the low estimate passed on so useful a traveller.

It is difficult to follow Baron Nordenskjöld in his occasional reference to Lelewel's (admittedly second-class) reproductions or reconstructions of maps and descriptions, which are open to any geographer to examine for himself (see on Edrisi, p. 141). Justin Winsor has surely thrown

very serious doubt on the tale of Columbus' early voyage to Iceland, but this is affirmed with apparent confidence on p. 84. Almost the same definiteness is shown as to the Zeno voyages (p. 86, n. 2).

The interesting paper by Dr. Dahlgren embodied in this volume seems to make, in certain places, the very assumption so ably condemned by Nordenskjöld himself, viz. that statements in the legends of a Mediæval map are to be accepted as determinants of date. Some critics will hardly share the author's confidence in the story of Macham's discovery of Madeira. The date of 1480 for the construction of the fort at Arguim is, we suppose, a misprint for 1448; but we doubt seriously whether the author's assumption that Nuno Tristam reached the Rio Grande can be maintained. The razzias of Prince Henry's seamen, villainous as they were, did not really "begin the African slave-trade." The coins found in Corvo are hardly an adequate proof that either Iberians or Phœnicians ever visited the Azores, though they probably were acquainted with the Canaries or the Madeira group. The African "azaguy" was surely not a "cutting" so much as a "stabbing" weapon. The Beatus Map, given on p. 11, is, of course, that of St. Sever, representing only one of the schools of Beatus cartography, and possibly not so near to the original work of Beatus as the Ashburnham map of the tenth century. The map of St. Sever is not of the eighth century, as implied by the title ("Map of World, by Beatus, eighth century"), but of the eleventh.

But on nearly all matters which properly concern the later Mediæval, and especially the Portolano, cartography, no student can afford to be without Baron Nordenskjöld's last work. It is even more essential than his Facsimile Atlas. His suggestion that the original Portolano scheme is due to Catalan draughtsmanship deserves close attention, and those who have already guessed at this solution, will be encouraged by the confirmatory judgment of the greatest authority on the subject. The author's treatment of the Scandinavian share in cartographical development, as might be expected, is of special value. He supports with much force the Scandinavian position of Pytheas' Thule, though we may think the Shetland site is not yet altogether out of court. These are but instances from a large body of valuable constructive work, in which the author's attempt to determine the length of the Portolan-mile, the standard of measurement in the only scientific maps of the Middle Age (chap. iv.), is perhaps the most noticeable feature. With this admirable study we may join for special mention the tables on pp. 8, 14, 25–44, 48, 52–53, 55, 88–89, 91, 113–114, 126, 131, 148, 167–176, with the author's remarks thereon. Perhaps Baron Nordenskjöld has been disgusted at the over-critical and depreciatory spirit which obtains in some quarters, and has resolved to show it scant respect; so great a scholar is, doubtless, well acquainted with the objections which have been urged against some of the theories and

pretensions which he apparently will not contest; but, constructively at any rate, he has, in his Periplus, as in his Facsimile Atlas, given us a princely volume full of indispensable material for the history of geography, and offering in many ways more definite and satisfactory solutions of difficult points than we ever had before.

GEOGRAPHY AT THE BRITISH ASSOCIATION, BRISTOL, 1898.

THE meeting of the British Association at Bristol lasted from September 7 to 14. On September 5, a tower erected on Brandon Hill to the memory of the Cabots was opened by Lord Dufferin, but the opportunity was lost of associating an interesting incident with the Geographical Section of the Association. No description of the tower and no paper on the voyage of Cabot was offered to the Section, nor were there any papers on local geography. The geographical interest of the meeting was thus quite apart from the place, and had no reference to local conditions. The comfort of the sectional meetings was largely due to Mr. Trapnell, the local secretary for Section E, to whose constant care and energetic co-operation the President paid a special tribute at the close of the meeting.

The composition of the section was as follows:—

President: Colonel G. Earl Church. *Vice-Presidents:* Lieut.-Colonel F. Bailey, Sec. R.S.G.S.; Prof. Boyd Dawkins, F.R.S.; J. Scott Keltie, LL.D., Sec. R.G.S.; B. Leigh Smith; General Sir Charles W. Wilson, K.C.B., F.R.S. *Secretaries:* H. N. Dickson, F.R.G.S.; H. R. Mill, D.SC. (*Recorder*); H. C. Trapnell, LL.B. *Committee:* Dr. W. T. Blanford, F.R.S.; J. Bolton; G. G. Chisholm, M.A.; Vaughan Cornish, M.SC.; H. T. Crook, M.I.C.E.; G. F. Scott Elliott; Dr. H. O. Forbes; F. Galton, D.C.L., F.R.S.; Prof. P. Geddes; Prof. R. A. Gregory; Georges Guyou; John T. Kemp, M.A.; Prof. J. Milne, F.R.S.; E. Delmar Morgan; Dr. K. Natterer; H. Yule Oldham, M.A.; E. G. Ravenstein; Prof. Elisée Reclus; G. E. T. Smithson, Sec. Tyneside Geog. Soc.; Eli Sowerbutts, Sec. Manchester Geog. Soc.; Sir J. Benjamin Stone, M.P.; G. J. Symons, F.R.S.

The total number of papers read was less than usual, being twenty-five; but a strenuous effort was made, in organizing the meeting, to ensure that every paper should be read in full, and time left for fair discussion. The proceedings of Section E were as follows:—

Thursday, September 8.—The President read his address, which is printed *in extenso* in the present number of the *Journal*. On the motion of Sir Charles Wilson, seconded by Dr. Scott Keltie, a vote of thanks was passed to Colonel Church.

Mr. Vaughan Cornish read a paper on "Waves," referring to wave forms in water, air, and sand. The paper was a preliminary account of

a research which, when completed, will be presented to the Royal Geographical Society. It gave rise to a brief but animated discussion.

The report of the Committee on the climatology of Africa was presented by the Chairman, Mr. E. G. Ravenstein. It includes an abstract of observations in different parts of tropical Africa, and an introduction of which the following is an abstract:—

"Meteorological returns have reached the Committee, in the course of last year, from twenty-six stations in tropical Africa.

"Niger Territories.—No returns have been received from Wari since the hostile operations against Benin, and there is reason to believe that the instruments at that station have been destroyed. Mr. E. G. Fenton has forwarded three months' observations from Old Calabar.

"Lambarene (Ogowai).—The set of instruments lent to the late M. Bonzon, of the 'Missions Evangéliques,' has been returned to Paris. The Rev. M. Coillard, well known for his excellent work in the Barotse country, and a trustworthy observer, having expressed a desire to purchase these instruments, the Committee have gladly accepted this offer, as a station in that part of Africa is much wanted.

"British Central Africa.—The organization of the meteorological service in British Central Africa has been entrusted to Mr. J. McClounie, the head of the scientific department of that Protectorate. From the great interest taken in the work by Mr. Alfred Sharpe, H.M.'s Commissioner, and Captain W. H. Manning, his deputy, we may fairly expect that the climatological conditions of this Protectorate will soon become thoroughly well known. The grant made by the Foreign Office has enabled Mr. McClounie to equip two second-order stations (Zomba and Fort Johnston) and ten climatological stations. Mr. Moir, meanwhile, has resumed his work at Lauderdale, and Mr. McClounie is endeavouring to enlist the co-operation of planters and other residents. Returns for from three to four months have already been received from ten stations, including one from Kambola, on the Tanganyika plateau, from Dr. J. G. Mackay.

"British East Africa.—Returns from nine Government stations have been received up to the end of 1897. These returns, owing to the occasional illness of the officials charged with the observations, and temporary absences, are not as complete as could be desired, but in default of something better they have added considerably to our knowledge of the climatological conditions of this Protectorate, especially as regards the rainfall. The exposure, in many instances, seems to be objectionable, and the occasional visit of a meteorological inspector to all these stations would prove of great value.

"In addition to the above, we have received a full year's return from the Scottish missionaries at Kibwezi. These returns include hourly observations for thirteen international term-days, and are by far the most complete received, up till now, from British East Africa.

"UGANDA.—Returns of the level of Victoria Nyanza, up to the end of July, have been received. The mutiny of the Sudanese unfortunately interrupted these valuable observations, but they have since been resumed."

The Committee has been re-appointed without a money grant.

Mr. H. N. Dickson communicated the preliminary results of his research on the temperature and salinity of the surface water of the North Atlantic Ocean for twenty-four consecutive months. This was partly effected by obtaining copies of the meteorological logs of vessels traversing the Atlantic, but also in large part by the voluntary assistance of a large number of ship-masters who collected samples of surface water, which were examined by Mr. Dickson in the Chemical Laboratory of the University of Oxford. The result was to admit of a series of synoptic charts of salinity and surface temperature being drawn—a thing never attempted before on the same scale—and these throw fresh light on several problems of physical geography. There was some discussion on the paper, in the course of which the magnitude of the work carried out by Mr. Dickson single-handed was referred to, and the pecuniary help given by the Royal Geographical Society was spoken of in terms of approval.

Dr. K. Natterer, of the University of Vienna, gave a general account of the oceanographical results of the Austro-Hungarian deep-sea expeditions in the Eastern Mediterranean, Sea of Marmora, and Red Sea. The results of the separate expeditions have been referred to in the *Journal* from time to time.

Friday, September 9.—Dr. J. W. Gregory gave a paper entitled "Theories on the Distribution of the Oceans and Continents," an abstract of which will appear in the *Journal*. It was illustrated by slides and models, and called forth an interesting discussion.

Mr. R. D. Oldham, Superintendent of the Geological Survey of India, gave an account of the Great Indian Earthquake of June 12, 1897, which he stated was the most severe ever recorded; the small loss of life it occasioned was due to the facts that the epicentral area, although of unprecedented extent, was situated in a thinly peopled district, and that the main shock occurred early in the afternoon. He showed a number of slides from photographs, illustrating the peculiar caprices of the shock in damaging buildings and railways, and in overthrowing monuments and trees.

Prof. Milne, F.R.S., followed with an account of the seismological observatories in Italy, and directed attention to the urgent importance of establishing such observatories in all parts of the world.

On Friday afternoon there was a large attendance, when Mrs. Bishop read an account of the valley of the Yangtse, based on her recent journey, already described in this *Journal*. Mr. Archibald Little and others made appreciative remarks on the paper.

Mr. O. H. Howarth followed with an account of a journey across the Sierra Madre of Mexico from Mazatlan to Durango, an abstract of which will be given in the Monthly Record.

The Section did not meet on Saturday, the day being spent by most of the members in taking part in various excursions. Of these, that of greatest geographical interest was the visit to Barry Dock, organized apart from the Local Committee by Section G, under the guidance of the President of that Section, Sir John Wolfe Barry. Contrasted with the scene presented to the excursionists from the Bath meeting in 1888, the site of Barry Dock presents a marvellous transformation. Then it was a vast empty reservoir, excavated in the channel between a sandy island and a barren shore. Now it is the only harbour in the Bristol Channel accessible at all times of the tide, crowded with steam and sailing vessels, and carrying on the greatest coal-export in the world, in the midst of a town of thirty thousand inhabitants, where ten years ago there was only a row of navvies' huts.

Monday, September 12.—The proceedings opened with a paper by Dr. J. Scott Keltie, on "Political Geography." He said that geography, like most other departments of science, is capable of practical applications to human affairs, and the application of the data of physical geography and anthropogeography to communities, states, or nations is political Geography. Physical conditions, such as position on the Earth's surface, determining seasons and climate, the surface characteristics of a region, such as its orography and hydrography, and the dimensions of the territory, all have direct bearings on the State. The question of boundaries and their definition is of vital importance in this respect; the natural limit of a neutral zone of desert, or at least waste land between two nations, gave way to the defined frontier—as often as not an arbitrary line not coincident with any natural feature, and of a validity depending on the general acceptation of the treaties by which it is defined. The utilization of natural resources and the amelioration of routes by land or water do much to develop a country, and bring out the real relation between land and people, which is the direct subject of political geography. The internal conditions of a country are to some extent responsible even for the forms of its government and its relations with other States. These are expressed peacefully mainly by international commerce, which takes place in spite of barriers both natural—such as seas, deserts, mountains—and artificial—such as customs tariffs. Internal development leads in certain circumstances to colonial expansion, and the relations of colonies to the mother country varies in accordance with the character of land and people. The rapid acquisition of foreign territory in recent years has given rise to certain new features of political geography—the sphere of influence, the leased territory, and the military occupation being the more important of these.

Mr. Yule Oldham pointed out the extreme importance of definite

views on political geography in education, and others took part in a short discussion.

Dr. H. R. Mill spoke of the prospects of a renewal of antarctic research. He pointed out that the question was a very old one, and that in the history of antarctic exploration, the problem has varied in the course of the centuries from the purely theoretical discussion of the possibility of antipodes, to the search for a vast Austral continent of value to colonists and commerce. Since the voyage of Cook confined the limits of Antarctica to the south frigid zone, and the efforts of a few whalers and sealers of the early part of the present century proved that it could not rival the arctic regions as a hunting-ground, the problem has become purely a scientific one. As a field for scientific research, the antarctic has been kept before the public by Dr. Neumayer of Hamburg for thirty years, and in recent years Sir Clements Markham and Sir John Murray have been indefatigable in pressing upon successive governments the claims of this region for a national expedition. The Royal Society, the Royal Geographical Society, and the British Association have given their powerful interest to the movement, but in vain. The immediate prospects of research are more favourable than the action of Government might imply. A small Belgian expedition with a band of scientific enthusiasts is now in the field, and Sir George Newnes has sent out the *Southern Cross* with Mr. Borchgrevink to make an attempt to traverse the ice-cap from Cape Adare. The results of this expedition may possibly be of value, but they can only be viewed as preliminary. A German committee has completed arrangements for sending out a finely equipped expedition under Dr. Erich von Drygalski in 1900, and the Royal Geographical Society proposes to head a subscription list for a British expedition with £5000. It is urgently important that the great expeditions now being organized should not be in any sense rival projects, but that they should work in harmony, so as to make the greatest possible number of simultaneous and comparable observations on such important and little-known phenomena as the meteorology and magnetic conditions of the south polar area. The preliminary results of the expeditions already at work will probably arrive in time to enable the plans of the larger enterprises to be laid with greater certainty than our present knowledge of the region will allow.

Sir Benjamin Stone, M.P., described his scheme for a national photographic record, the plan including, not only the perpetuation of ancient monuments, historic events, and contemporary social life, but also the sites of towns and other purely geographical subjects.

In the afternoon Mrs. Theodore Bent communicated a paper on "Sokotra," describing the expedition under the guidance of the late Mr. Theodore Bent.

Sir Charles Wilson, F.R.S., gave an account of the Upper Nile region with reference to the reconquest of Sudan.

A crowded audience had collected in order to hear M. Louis de Rougemont on his long residence in Central Australia. He said that he was shipwrecked in 1863 on an islet off the north coast of Australia, and after two years of solitude there, succeeded in making a landing on the continent. Here he met a friendly tribe, who received him as one of themselves, and after some time he set out to cross by land to the east coast, aiming for the settlement of Somerset, on Cape York. Not knowing of the existence of the Gulf of Carpentaria, he mistook the east coast of the gulf for the Pacific, and, coasting northwards, eventually came back to his first landing-place after an absence of about eighteen months. He then attempted to penetrate southwards, with the hope of crossing the continent, but, baffled by the difficulties of the desert, and disheartened by being attacked more than once by parties of white men, who took him for a hostile native, he gave up all hope of escape, and settled down with a native wife. He lived for over twenty years in a mountainous country near the centre of the continent; but then, on the death of his wife, he determined to return to civilization, and, meeting a party of gold-prospectors near Mount Margaret, he reached Melbourne in 1895.

Dr. Keltie stated that M. de Rougemont had been introduced to him and Dr. Mill several months before, and that after a close cross-examination they were satisfied that he had been in Australia. A very long discussion followed, from which it appeared that some members considered that the narrative was too unusual to be true, while some thought that it resembled other published accounts of travel too closely to be genuine.

Tuesday, September 13.—In the forenoon Sir Thomas Holdich was to read a paper on Tirah, but in his absence, through illness, it was read by Sir Charles Wilson, and Mr. Yule Oldham showed the accompanying slides.

Mr. C. W. Andrews gave a brief outline of his observations on Christmas island, a subject of which he will treat fully before the Royal Geographical Society.

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Prof. Elisée Reclus set forth his scheme of a great globe on the scale of 1 : 500,000 in a powerful and eloquent address. The plan of the globe was fully described before the Royal Geographical Society, and the full paper will appear in the *Journal*. Sir Richard Temple spoke emphatically in favour of the scheme, and Dr. H. R. Mill called special attention to the importance of having separate sections in the form of relief maps, on the natural curve of the Earth, of separate regions.

Prof. Patrick Geddes gave a description of the geographical museum or Outlook Tower, which he is establishing in Edinburgh, and expressed the wish to see similar towers erected in all large towns. An abstract of his paper appears in the Monthly Record.

Wednesday, September 14.—On the last day of the meeting the Section met early to hear three papers. The first, by Mr. Henry T. Crook, of Manchester, was on the orthography, selection, and location of names for the national maps. He said—

"The method of determining correctly the location or orthography and relative importance of place-names for the national maps, is a branch of cartographical science which has scarcely received the attention its importance merits. With the greater number of names which must appear there is no difficulty. It is with the names of smaller places, detached houses, farms, and ground features of the remoter districts that the difficulties arise, yet the correctness of these is often of equal importance topographically to those of populous towns and well-known places. The Ordnance Survey system of obtaining the opinion of three persons in the locality as authorities seems rather haphazard, for no qualification is required in the authorities, nor does the ultimate selection in case of difference of opinion appear to be anything better than empirical. The Committee of Inquiry into the Ordnance Survey in 1892–93 paid little attention to the subject except in the case of Welsh names, in which they consider the system had not been altogether a success. The errors in other parts of the kingdom largely arise from analogous causes to those investigated, namely, from misunderstanding the local dialect or pronunciation. Wales and Scotland only present the difficulties in a more acute form. The errors in names in the first map of Scotland led to the adoption of a method for that country which is a step in the right direction, namely, seeking the assistance of local societies, in this case the Royal Scottish Geographical Society. This principle carried out still further by the reference of doubtful names to more strictly local societies, or a body constituted from them, is desirable. But if local knowledge is desirable in the case of orthography of place-names, it is not only desirable, but essential to success, in selecting the names for the smaller-scale maps. The present method is a failure, as witness the new one-inch maps in Lancashire, where not only are the names of important places omitted or wrongly placed, but the selection of names which do appear is generally unsatisfactory. This arises from the modern method of producing the smaller-scale maps, viz. the mechanical reduction from the larger scale. It is stated that the names on the smaller-scale maps are gone over on the ground, but the revision seems perfunctory. It does not prevent serious error. The revision of the survey generally should have been carried out from local centres, where local knowledge and experience would have had their due weight."

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Colonel Farquharson, Director-General of the Ordnance Survey, said that the Survey had always taken the utmost care to obtain correct names for the maps. He did not think Mr. Crook's sarcastic references to the three independent authorities at all justified. It often happened that local names were in dispute, and cases had occurred in which the squire, parson, and schoolmaster all held a different form of the name to be correct. In such a case the officer of the Survey was obliged to make an arbitrary choice. The question for the surveyors was, not to ascertain the correct or historic form of a name, but the form of the name used locally. Although a committee of the Royal Scottish Geographical Society had undertaken the revision of names on the map of Scotland, they found the task too heavy, and had to greatly limit their programme. He would cordially welcome the co-operation of local societies or of competent individuals; but he held that the proper course to take for any one who had defects in the maps to point out, was to send the corrections to the office at Southampton, and not to write critical articles in local newspapers that might never come under the eye of the Survey officials. Sir Charles Wilson emphasized the importance always attached by the Survey to the proper selection of names, and an animated discussion, in which many members took part, followed.

Captain B. Baden Powell, of the Scots Guards, read a paper on balloons and kites in geographical exploration, in which he pointed out the exceptional advantages offered by the meteorological conditions of the Nile valley for experiments in long-distance ballooning.

The proceedings of the Section were brought to a close by a paper on electric balloon signalling by Mr. Eric Stuart Bruce. Mr. Bruce proposes to use a transparent captive balloon of gold-beater's skin, about 7 feet in diameter, to raise a powerful electric lamp (situated inside the balloon) to a height of 500 feet or more, and by the use of long and short flashes to use it for distant signalling. He considers it particularly suitable for use on polar expeditions.

The usual vote of thanks were proposed, but the rush of the audience from the room made the formality almost inaudible, and quite deprived it of any appearance of grace.

Committees were appointed for the exploration of Sokotra with Dr. Forbes as secretary, with a grant of £35; for the study of the physical conditions and plankton of the English Channel (in conjunction with Section D), by Mr. H. N. Dickson and Mr. Garstang, with a grant of £100; and for the study of Prof. Reclus' scheme of a great globe, without a grant.

Considered as a whole, the proceedings of Section E, while no less popular than in previous years, were more satisfactory on account of the higher average scientific value of the papers than is usually the case. It is, however, questionable whether the labour of organizing such a meeting is not in great part thrown away. The number of geographical

specialists in this country is small, and a regrettably large proportion of these do not consider it worth while to attend the Association, hence the discussions are apt to fall into the hands of amateurs, or even of faddists, while the large audiences attracted by any paper which is supposed to be likely to turn out sensational gives to the public an utterly wrong impression of what geographical science is, and at the recent meeting led one newspaper to refer in good faith to the contrast between "the geographical and scientific sections."

THE SWEDISH ARCTIC EXPEDITION.

The leader of the expedition, Dr. A. G. Nathorst, writes from on board the *Antarctic*, near Tromsö, September 6, 1898—

"Having now finished my arctic expedition for this year, I send you some lines as to the work which has been done.

"We left Tromsö June 8, and went to Bear island, which was reached on the 13th; there we stayed about a week. The whole island was surveyed, and an excellent map (1 : 50,000) was drawn by Lieut. Kjellstrov, partly also by Dr. A. Hamberg. This survey shows that the old maps were quite incorrect. The geological work was also successful. As you will be aware, there were known only carboniferous strata and an old rock without fossils. In this we found fossils, showing that the age was Silurian; and, besides, we discovered another series, the age of which is probably Devonian. But this is not all, for we also discovered fossils in the 'Three Crowns,' forming the top of Mount Misery, which probably will prove to be of Jurassic age. The geology of the little island is, consequently, most interesting. Some new botanical and zoological discoveries were also made. From Bear island we went to Hope island, but a heavy swell unfortunately made landing impossible, so that we must content ourselves with having had the island photographed from all sides. From Hope island I went east of Spitsbergen, in order to ascertain the position of the ice-pack, but, as expected, the ice did not permit of our reaching King Charles Land. I consequently went to the west coast of Spitsbergen, where Bell sound was surveyed and mapped; a most necessary piece of work, since the old maps of Van Mijen bay are very incomplete. After having visited some points of interest in Ice fiord, I made a series of hydrographical observations westwards, to the margin of the Greenland ice-pack (78° 1′ lat., 4° 9′ W. long.). This having been done, I went south and east of Spitsbergen, and reached King Charles Land, which was completely surveyed and mapped on the scale of 1 : 100,000. Thence I went to the 'White island,' which was circumnavigated; we landed on the only two places

where landing is possible, and the geology of the island was ascertained. This island is curious indeed, completely covered by an ice-cap (inland ice), which is broken off at the sea-shore, ending in a perpendicular ice-wall, just as is found on the antarctic continent, although in miniature. Great table-formed icebergs are given off from this ice-sheet. From the White island, which is larger than is indicated on the maps, we made our way through alternating heavy ice and open water to Charles the XII.'s island, whence we went northwards, and reached 81° 14′ N. lat. If we had been there a fortnight or so earlier, we should certainly have reached a higher latitude, but northerly winds had prevailed for some time, so the pack had driven south again. We then passed north of the Seven islands, and went to Treuenberg bay, Grey Hook, and Danes island, from which we steered southwards along the western coast of Spitsbergen. When we reached the south end of Prince Charles foreland, the circumnavigation of the whole of Spitsbergen, with the surrounding islands, was completed. I don't know if any vessel has done so before. My intention to go to the Storfjord was made impossible through heavy gales, and having in vain waited almost a week for the weather to improve, I steered southwards, passing Bear island again, and making hydrographical observations.

"The scientific work of the expedition has been most successful; we have large geological, botanical, and zoological collections. The geology, zoology, and botany of King Charles Land is now completely known, and there are important connections between the geology of Spitsbergen and that of Franz Josef Land."

ARGENTINE GEOGRAPHY AND THE ANCIENT PAMPEAN SEA.*

By Colonel GEORGE EARL CHURCH.

INSTEAD of addressing you upon geography as a science, or summarizing the triumphs of explorers during the past year, I shall invite you to accompany me to southern South America—a step towards the antarctic regions—and let me try to add to your knowledge of Argentine geography and the ancient Pampean sea.

The matchless voyage of Magellan gave rise to one, in 1526, for the discovery of "the islands of Tharsis, Ophir, and Eastern Cathay," the command of which was given by Charles V. of Spain to Sebastian Cabot, the son of John. Sebastian, *en route*, lured by silver-tongued fable, diverted the expedition, sailed for and ascended the Plata estuary and river Paraná, and attempted the conquest of the Plata valley. Disaster attended him; and, with a single ship, he returned to Spain. That valley is now being developed into a prosperous state by the application of £200,000,000 sterling of European capital—three-fourths of which is British—and is already the home of five millions of thriving, intelligent, and energetic people.

* Presidential Address to the Geographical Section of the British Association, Bristol, September, 1898. Maps and sections, p. 444.

Sebastian Cabot having been brought up as a boy in this city of Bristol, I have thought it not inappropriate to this occasion to give you some idea of the land which he tried to conquer, and how nature has there marshalled her forces. She has, within easy reach, all the elements she requires for action upon the most imposing scale; and it must be admitted that she has brought them lavishly into play. The present drainage area of the Plata basin is, according to Dr. Bludau, 1,198,000 square miles, being over two and a half times that of the entire Pacific slope of the Andes. The minimum water-discharge into the Plata estuary would, every twenty-four hours, make a lake one mile square and 1650 feet deep. About 74 per cent. of it would represent the flow of the Paraná, and 26 per cent. that of the Uruguay river. In my subject, the latter plays only a secondary part; the majestic Paraná and its branches assume the primary *rôle*. These interlace with the affluents of the Amazon along a line of 14 degrees of longitude. Even on the ocean, I have been unable to realize vastness, as regards quantity of water, to the extent which I have while standing on the bluff overlooking the Paraná at Rosario, and also on the bank of the Amazon at Obydos. Dark, profound, and mysterious, the rivers ceaselessly roll past, ever in the same direction, never to return; and, awestruck, one reflects that, for æons of ages, they have never halted in their stately march, and asks where and what is the power that gathers and lets loose these mighty floods?

Extent of the Plata Basin in Ancient Times.—I shall try to show that the Plata drainage area was, in a recent geological period, much more extensive than it is to-day; that its most northern limit was in 10° 44′ S. lat., and that nearly the entire waters which now unite to form the Madeira river, the main affluent of the Amazon, once flowed southward into a Pampean sea, which penetrated north over the plains of the present Argentine Republic, to about 19° S. lat.

To elucidate this proposition, I must call attention to the topography of that great Bolivian basin across which the whole northern and eastern slope of the Bolivian Andes and the western slope of Brazilian Matto-grosso send their abundant drainage to the falls of the Madeira. The present elevation of the upper fall has been found, by instrumental survey, to be 547 feet above sea-level. The distinguished engineer, Julio Pinkas, who made the survey, estimated the drainage area of the Bolivian basin at 400,000 square miles. This is somewhat in excess of, but perhaps more accurate than, my own estimate, made when I descended the Mamoré river and the Amazon in 1871. Elsewhere I have shown that the Bolivian rivers lie upon a great plateau, high above the river Purús, as well as above the lower Madeira. The Andes form the south-western and western rim of this plateau; and, between the Mayu-tata and Purús, push low hills north-east towards the falls of the Madeira. On the eastern side are the Matto-grosso highlands, and, south-east, the low Chiquitos sierras of San Juan, the Sunsas, San Lorenzo, Ipias, Chochis, and Santiago, some of them overlooking the Argentine Gran Chaco, and having a southern drainage into the river Paraguay. The grand rim of the Bolivian basin has two breaks; one leads to the Amazon valley, by the falls of the Madeira, and the other, in longitude 62° west from Greenwich, and latitude 18° south, opens into what is now known as the Plata basin. Further on, I will attempt to show how a dam was gradually thrown across this southern gap, until its elevation, once much inferior, became superior to that of the ancient lip of the falls over which the Bolivian rivers now plunge.

The mean flow of the Madeira river, at the moment of receiving its united Bolivian tributaries, is, according to Keller, 8654 cubic metres per second, equal to 305,616 cubic feet. Pinkas makes it 6874 cubic metres. These must be rough calculations; for the mean flow of a river of such variable conditions could only

be accurately measured by a series of observations extending over several years. I believe it is equal to that of the Paraná and Uruguay at their junction.

Outline of the Basin.—The Matto-grosso highlands, overlooking the Bolivian basin, are composed almost wholly of red sandstone, overlying argillaceous schists; but near the headwaters of the Guaporé river, which skirts their western base, are found rose-coloured gneiss, talc schists, and sandstones, on which frequently rest large areas of a recent alluvium, locally called *canga*.

The Chiquitos sierras rise, on an average, from 1400 to 2000 feet above the sea. (Minchin mentions a peak 3600 feet high.) I agree with Dr. J. W. Evans that, as described by D'Orbigny, they present evidences of belonging to the earlier Brazilian highlands, rather than the younger elevation of the Andes. The western section is a wall of friable, ferruginous sandstone, sometimes flat-topped, while the extension, towards the Paraguay river, is a compact sandstone overlying talc schist, which, towards the north-east, rests on gneiss in decomposition. The San Juan and Sunsas sierras are the most northern of the Chiquitos group. The former is mostly of gneissic formation, but the latter is of sandstone resting on talc schist.

The Bolivian Andes, which face the Amazon and the Gran Chaco, are almost entirely composed of feldspathic sandstones, micaceous and blue slates, clay and sandy shales, at times showing a thickness of from 10,000 to 15,000 feet. In riding from Cochabamba to Santa Cruz de la Sierra, I have especially noticed them exposed upon a gigantic scale.

The upper fall of the Madeira, called Guajará-mirim, runs over the ferruginous, conglomerate rock called *canga*. This rests on argillaceous sandstone, which crumbles easily by the action of running water. The *canga* gradually becomes undermined, and, breaking in pieces, is moved by the currents into deep water: thus the elevation of the fall is gradually lowered. Keller gives a notable example of such erosion, at a point called Matucaré, on the lower Madeira river. All the other barriers which form the falls are varieties of granitic and metamorphic rocks.

About 18 miles above the mouth of the Beni branch of the Madeira, and below that of the Mayu-tata, is the fall of Esperanza, having a drop of 20 feet in a length of 1000. According to M. V. Ballivian, the rock is of *canga*, the same as that of Guajará-mirim.

Pinkas found that, on the right bank of the upper Madeira river, several places are still visible where the erosive action of the waters has stripped the primitive rocks, anciently covered by a bed of ferruginous sandstone. I also saw evidences of the erosive action of the river near the upper falls, and am disposed to believe that, in the lapse of centuries, one or two rapids higher up the river have disappeared; not, however, entirely, for a reef of ferruginous conglomerate still partly crosses the Mamoré river, between the mouth of the Guaporé and the town of Exaltacion. It is probable that the western Matto-grosso hills once extended westward to the Beni fall of Esperanza, where they met the Andean foothills, and added to the height of the barrier which prevented the river system of Bolivia from breaking through to the north-east. How high that barrier may have been, it is difficult to determine, owing to the country being densely forested; but, in the fork of the Beni and Mamoré, I found hills perhaps 150 feet elevation above the river; and Keller mentions some on the left bank of the Beni near its mouth. The rocks of Matto-grosso are so soft as to offer but slight obstacle to the erosive power of the mighty flood of the Madeira: and, if we admit that the lip of its upper fall, when the river began to flow over it, was only 100 feet higher than now, it will be but a small allowance in comparison to the depths which even unsignificant streams have excavated over the immense area of Matto-grosso. The falls of the

Madeira appear to have completely cleared off and exposed the granitic and metamorphic rocks upon which the Matto-grosso shales and sandstones once rested.

Immense quantities of detritus have found their way down the Andes. The volume carried by the little river La Paz, the remotest branch of the Beni, is astounding. I once descended it to ride round the base of Mount Illimani. The river is so hemmed in between the material of the Titicaca basin and that monarch of the Andes, that I had to ford it 108 times in one day. It has cut a profound gorge through the inland range, perhaps 50 feet wide and 600 feet deep. The overhanging precipices looked not over 40 feet wide at the top. Through this dark rent, which I had to penetrate or turn back, the river swept me, horse and all, as if I had been launched from a catapult.

The bed of detritus and alluvium, which the river skirts for about 50 miles, is one of the most remarkable in the world. Forbes gives it a total thickness of 2000 to 2500 feet "of alternating beds of grey, bluish, and fawn-coloured clays, gravel and shingle beds, with boulders of clay slate, greywacké, and granite, frequently of enormous size and well rounded, as if by the action of water." In my ride down the valley, I saw nature at work tearing into this deposit, and sending it on its way to the great basin of the Beni and Mojos. During certain months, generally from November to March, a prolonged and violent local storm may arise in some lateral valley of the river. The waters then sweep impetuously down, taking with them hundreds of thousands of cubic yards of material which they pile across the La Paz river. The mass of clay and boulders rapidly becomes cemented and compacted, and holds its place until the La Paz in turn, swollen by some storm from Illimani, bursts the huge dam and hurls its contents down the valley. I noticed boulders of many tons weight, at least 300 feet above the bed of the river, sticking, like half-exposed marbles, in the side of the perpendicular wall of detritus which towered even high above them.

Similar denudation is going on along the entire Andean slope. The great Rio Grande carries a prodigious mass of alluvium into the gap which lies between the extreme eastern counterfort of the Andes and the Chiquitos sierras. Even its little branch, the Piray, which I descended, desolates the country far and wide, in periods of flood, with trees, sand, and mud. The Rio Grande and the Parapiti must have transported to the plain, to the east of Santa Cruz de la Sierra, millions on millions of cubic yards of material, and have filled it to a depth of several hundred feet. The examples I have given, from personal observation, can, however, but faintly convey an idea of the grand scale upon which nature is at work tearing down the Atlantic slope of the Bolivian Andes. So far, she has succeeded in only outlining the task she has assumed; for she appears to have finished nothing. The finer touches cannot be put on with such riotous vigour.

Later, I shall show how the closing of the southern gap caused the formation of a lake in the Bolivian Mojos basin, the lacustrine character of which is not yet eliminated; for, during a period of about four months of the year, some 35,000 square miles of its surface are covered with the surplus water which cannot find exit over the falls of the Madeira, they not yet having been worn down enough to give complete drainage to the basin; or else this is not yet sufficiently silted up to keep it out of water. Castlenau says that, "Due to their horizontality, all the plains, from the mouth of the Mamoré to the Pilcomayo, are inundated from October to March, and present the aspect of a great ocean dotted with green islands;" and, speaking of the great southern gap, says, "Across the Monde Grande, a simply overturned tree would change the course of the waters." D'Orbigny is eloquent in his descriptions of the "smooth surface" and "unlimited horizon" of the vast plains of Mojos and the Beni.

Between Santa Cruz de la Sierra and the northern frontier of the Argentine Republic, the Pilcomayo river gathers its waters amidst masses of red sandstone and argillaceous schists. Further southward, the Andes are broken into a number of secondary ridges of palæozoic composition, among which are the sources of the Bermejo and Salado. In the most southern extension of these ridges, we find limestones and compact sandstones, mica schist, gneiss, and granite. From about lat. 30° S., the Andes lose their great width, and thence confine themselves to the Pacific coast ridge, as far south as the Straits of Magellan. According to De Moussy, "the lower sierras, which lie to the east, present a great variety of stratified, crystalline rocks, saccharoids, slate schists, bituminous sandstone, basalts, obsidian, trachites, pumice, crystallized and amorphous quartz."

The Sierra de Cordova, extending north and south for nearly 300 miles, and having a summit about 7500 feet above ocean-level, was probably an ancient group of islands in the Pampean sea. It consists of several parallel chains, composed principally of quartz, gneiss, and limestones of various colours. De Moussey found trachitic rocks on their northern extension, and evidences of volcanic action. South-west, and separated from the Sierra de Cordova, is the low San Luis range of gneiss and mica schist, and sometimes crystallized quartz. Vast masses of rounded shingle, covered by a thin cap of argillaceous earth and coarse granitic sand, border the valleys. The Alto Penasco sierra, 40 miles west of the San Luis range, is also composed of crystalline rocks. The Cordon de Paramillos, near Mendoza, is of porphyry, sandstone, schists, and limestone. Here also, "immense quantities of rounded and rolled shingle cover the base of all the chains and interior valleys. The torrents cut the accumulated *débris* to a profound depth, and expose its enormous thickness. The bottoms of the valleys are entirely composed of it."

Penetrating north of Mendoza, we find white sandstone, and mountains of red sandstone and argillaceous conglomerate in full process of decomposition. These abound, above all, in the provinces of La Rioja and Catamarca.

Southern Extremity of the Basin.—From Cape Corrientes inland, ranges of hills, irregularly massed in line, extend north-west about 150 miles. They are known as the Sierra de Tandil, and are widest at Tandil. Their greatest elevation above the sea is 1476 feet. My old friends, Heusser and Claraz, say the range is "composed of sandstone caps resting on gneissic-granite, showing the Pampean formation in the valleys and on their slopes." Sometimes the gneissic-granite shows bare, and at others elevated into sierras with slopes covered with Pampean formation.

Further south-west, and lying between the Tandil and Bahia Blanca, are the metamorphic sierras Phillahuinco, Ventana, and Curamalal, extending west and north-west, a total length of about 100 miles, nearly to Puan. In 1859, I spent a turbulent period of several months among these mountains, as a member of a commission charged to explore the south-western frontier of Buenos Ayres, which was then being raided by the Patagonian, Araucanian, and Pampa tribes of savages. Referring to my old field-book, I find evidences that some of my notes were made in a hurry.

The greatest bulk of the Ventana range appears to be gathered near the highest peak of the Curamalal section, the elevation of which, by trigonometric measurement, I found to be 3363 feet above sea-level, and the Ventana peak 3563 feet. The inclination of their strata is from 60° to 85°, dipping, with little variation, to the north-east. On their south-west slopes, so far as we explored them, these mountains are composed of extremely hard quartz rock, white, pink, and other colours. In many places, it was cut into large rhomboidal-shaped solids.

The highly calcareous, argillaceous rock-cap of the plain, which lies between the Ventana and Bahia Blanca, slopes west-south-west, its elevation at the southern foot of the Ventana range being about 500 feet, and at Nueva Roma about 230 feet, above sea-level.

Scattered over the surface of this plateau are many hollows, which, in some instances, are 100 feet below the general level. At their bottoms small lagoons are frequently found.

On the *northern* slope of the culminating peak of the Ventana, I found a conglomerate of rounded quartz pebbles, cemented by sandy, ferruginous matter. I have seen specimens of similar conglomerate from the north-west slope of the Curamalal range. I do not know the elevation of the bed which I found, but, for several reasons, believe it to be about 1200 feet above sea-level. It was, in great part, cemented to the quartz rock of the mountain, although masses of it, cubic yards in volume, had broken down or become displaced. Darwin states that, from 300 to 400 feet above the plain on the *south* side of the Ventana (estimated at 840 feet elevation by some Spanish officers), he "found a few small patches of conglomerate and breccia, firmly cemented by ferruginous matter to the abrupt and battered face of the quartz, traces being thus exhibited of ancient sea action." He thus estimates the height of that which he found on the south side of the mountain at, approximately, the same as that which I found on the north side.

Explorers differ as to the character and structure of the great belt of dunes which stretches along the coast from Cape San Antonio to Bahia Blanca. I am familiar with them for a distance of only 70 miles east of the latter place, along which extension they are massed to their greatest breadth and height. Perhaps an unpublished leaf from my note-book, of 1859, will enable you to realize what they are as I saw them:—"We proceeded to explore the course of the river Mostazas among the dunes. For 7 miles we forced our horses over sandhills and through marshes and lagoons, although they sunk to their knees at every step, and frequently floundered to their breasts, in the burrows of the *tuco-tuco*, the *Ctenomys magellanica*, about the size of a small rat. At last they lay down completely exhausted. Far to the east, we could still distinguish lagoons, but not a break in the coast-line gave indication of the outlet of the river, while all around us the bare sandhills reflected the sun with painful brilliancy. The exhausted condition of our horses obliged us to return dismounted. The dunes near the coast are composed of pure quartz sand of every colour, nearly all of it translucent. As they extend towards the interior, they have a slight mixture of earth, until their inland line is found to contain a preponderance of light pulverized soil. Gradually a scanty vegetation appears, until, bordering the fertile lands, they are covered with coarse grass and a few stunted shrubs. Viewed from the north, they have an abrupt descent towards the west. Their coast-line is about 110 feet high on an average; but inland they are of every elevation, from 5 to 100 feet. The south-west gales violently agitate them, and cloud the air with their materials. Frequently, bowl-shaped excavations are found near their summits, which appear like works of art, so regularly are they scooped out by the wind, which must have been of terrific force. One of these, a detached hill of sand and dust, on the Sauce Grande river, about 12 miles from the coast, has had at least 5000 cubic yards of material thus taken out near its top. At the bottom of the excavation I found several fragments of quartz rock, like that on the southern slopes of the Sierra Ventana. In all the dunes composed of pure sand, I found, by digging 4 inches below their surface, on their sides or summits, that the sand was quite wet. Such was the case during our stay, although a very dry season. Numberless little lagoons, from 50 to 150 feet in diameter, with bottoms of soft mud, are

scattered among them, around the margins of which grow rushes, weeds, and bunches of the exquisitely beautiful pampa-grass, the *Gynerium argentium*. Often, when the ponds were nearly dry, the soft silky flowers of the pampa-grass had covered their muddy bottoms with a white mantle. Numerous aquatic birds are to be seen swimming in the shallow water of the open ones. Sporting with each other are *nutrias* (the South American otter, the *Myopotamus Coypus*), ducks, geese, black-necked swans, water-hens, and rose-coloured spoonbills, all so tame that I could sit on horseback within 20 feet of them without disturbing the amusements. I have counted fourteen otters in a small lagoon; and, from the apparent familiarity with which they rubbed noses with the ducks, they were as much a part of the family as any of the feathered tribe. I never molest them. It would be a pity to break in upon their Arcadia."

I have lingered among the Ventana mountains and in their vicinity, as they were once lofty islands which played an important *rôle* in arresting and protecting the Pampean mud.

Eastern Boundary of the Basin.—Cuyabá at the head of the Paraguay river, is, according to numerous observations of Clauss, only 660 feet above sea-level. The valleys around it are bounded by vertical cliffs of red sandstone overlying argillaceous shales, which easily disintegrate. The Matto-grosso highlands, south of Cuyabá, as far as Paraguay, are practically unexplored; but I have no doubt they are of the same formation of sandstone and shales resting on metamorphic rocks.

The Apa river, which is the northern boundary of Paraguay, drains a limestone district. Bourgade says "the main framework of Paraguay is a dark-red sandstone, but basaltic formations may be seen in many parts. Immense areas are covered to a considerable depth by a fertile red earth representing the decomposition of the sandstone hills."

From Asuncion, the capital of Paraguay, south-east to the Apipé rapids of the river Paraná, the Cordillera of Caa-guazu throws off a range of hills which overlooks a great triangular space at the south-west corner of Paraguay, slightly elevated above the sea, and consisting of low sandy ground and morasses, at times flooded by the Paraguay river. This district, united to that of the Ybará lagoon, in northern Corrientes, was probably the delta of the Paraná when it emptied into the ancient Pampean sea. The river is charged with but little silt in comparison to its much smaller affluent the Paraguay; but in flood it carries a volume of water said to be ten times that of the latter stream, and its width, along the northern sandstone border of Corrientes, is from 3 to 9 miles. The alluvium, from the immense area of Brazil which it drains, is arrested by the rapids, reefs, and falls of its middle course, where it violently tears a deep channel through huge beds of red sandstone, to afterwards unite its yellowish waters with those of the muddy Paraguay.

Lying between the rivers Paraná and Uruguay is the Argentine Mesopotamia, the provinces of Corrientes and Entre Rios, covered with modern alluvium. The former is gently undulating, and is half drowned in lagoons, the largest being the famous Ybará. The south and south-western part of Entre Rios is composed extensively of argillaceous earth, and the whole State is traversed by ridges of low hills running nearly north and south, the main ones never exceeding an altitude of 650 feet above sea-level. The framework of the province is of sandstone, covered in some places by shell limestone, and sometimes by granular limestone. The north-eastern part is sandy, with numerous hillocks of siliceous gravel. The exposed sandstone, on the river Gualeguay, extends north almost to the Ybará lagoon. On the left bank of the river Paraná, just south of its junction with the Paraguay, is the town of Corrientes, built on a red sandstone bluff. The same stone shows

for 30 miles down stream, where it disappears; and thence, for 240 miles the banks sometimes rising to a height of 80 feet, and then at Goya descending almost to the river-level, are composed of sandy clay; but near Bella Vista are masses of rolled pebbles. Near the boundary-line of Corrientes and Entre Rios, the banks of the Paraná are very low on both sides of the river, and continue so for nearly 100 miles; but thence, southward, for 150 miles, the left bank is margined as far as Diamante by a range of hills from 125 to 160 feet high, at times boldly escarped and presenting a fine geological section. From Diamante the hills trend inland south-east about 50 miles, as far as Victoria; and they probably formed the border of an ancient channel of the river Paraná.

From Santa Fé to the head of the Plata estuary, the right bank of the Paraná shows a precipitous bluff of reddish clay, varying from 25 to 65 feet above mean river-level. It is being gradually undermined, and tumbles in great blocks into the river to add to its volume of silt.

The Uruguay river flows, almost throughout its course, over a rocky bed, mostly of red sandstone, at times very coarse, and then, again, of extremely fine composition; but below La Cruz, in Corrientes, there is much limestone, albeit the sandstone still predominates. The Uruguay is, except in flood, a clear-water stream, and, even at its highest level, carries comparatively but little silt.

I have ridden over much of the Banda Oriental del Uruguay. The southern and western half lies from 150 to 300 feet above sea-level. Darwin is correct in saying, "It has a gently undulatory surface, with a basis of primary rocks, and is in most parts covered up with an unstratified mass, of no great thickness, of reddish Pampean mud."

Secondary Rivers.—I refer again to the very important rivers Grande and Parapiti. Minchin says of them, "The Rio Grande drains a considerable part of South-Eastern Bolivia. It has its sources among the ranges bordering the table-land, and flows for some 400 miles through a deep, narrow gorge, and reaches the plains in lat. 18° 55′. Bending north, it then describes a semicircle, and finally runs north-west to join the Mamoré. In its course across the plains, and as far north as lat. 17° 30′, the river flows through a wide sandy bed, bounded by banks from 16 to 25 feet high. The Parapiti rises at an elevation of 2030 feet in lat. 19° 59′ 18″, long. 63° 4′. At the close of the dry season it flows 65 cubic yards per second, and is then absorbed by the sandy region of the plain. In the wet season it runs through a well-defined bed as far as lat. 19° 6′, long. 62° 22′, and then spreads through the swampy, forest-covered plain. Its waters, again uniting, cut through the south range of Chiquitos at Qumome pass, and form Lake Concepcion."

Between 20° and 30° S. lat. the arid, Andean slopes collect and send south-eastward, across the Gran Chaco, the waters of the three great rivers Pilcomayo, Bermejo, and Salado or Juramento. They are almost without an affluent once they leave the foot of the mountains, where they have their greatest volume. Sometimes they split into several channels, making narrow and enormous islands in the plain. They are all very crooked, and have uncertain beds, at times changing an old course for a new one miles distant. Thus they erode and tear away great quantities of Pampean material, dissolve it into silt, and pour it into the Paraguay and Paraná. Pelleschi, in his admirable work on the Gran Chaco, estimates that "the soil annually subtracted from the territory of the Chaco by the Bermejo alone, equals 6,400,000 cubic yards."

The rivers Saladillo, Primero, and Segundo provide the water to meet the evaporation from the great inland lake of Porongos. The Tercero and Cuarto unite and enter the Paraná near Rosario, with a considerable volume of water.

The Quinto, with other small rivers, draining the southern spurs of the Cordova range, are absorbed by the thirsty Pampean swamp, La Amarga.

Some of these rivers carry a large quantity of lime, and many of their westerly affluents carry so much as to have a white colour, thus accounting for the considerable number of them called "Rio Blanco."

A large river system, having many ramifications in the provinces of La Rioja, Mendoza, and San Luis, gathers into lagoons and main channels to find its way to Lake Urre Lauquen, and, in floods, to the Colorado. Physical and climatic changes, of which I shall treat, have profoundly modified this section of the Argentine Republic, and reduced the volume of its waters.

I am indebted to several of the Argentine railway companies for sections of their lines, made from instrumental surveys. From these, and from other sources, including a carefully prepared table of altitudes by the Argentine engineer, A. Schneidewind, I have had plotted the sections which accompany this address.

Sections of the Country.—Section 1 shows a part of the coast-line of the Southern railway. It is practically a cross-section of the east coast of the province of Buenos Ayres from north to south, where the lowest part of the Pampean beds slopes into the ocean. It passes also near the head of Samborombon bay, which was once a great muddy estuary extending far inland, and the home of countless myriads of small crabs. The land slope of this bay so gradually merges into the ocean that, at a little distance, it is difficult to tell where the shore-line meets the water. Century by century, it now slowly advances seaward.

Section 2, from Buenos Ayres to Rosario and Tucuman, shows with what regularity the country rises, from south-east to north-west, up to the outlying foothills of the Andes.

Section 3 is the first 350 kilometres of the Neuquen extension of the Southern railway, and shows in part the relation of the Colorado to the Rio Negro.

Section 4 is the Buenos Ayres and Pacific railway to Villa Mercedes, and thence to Mendoza by the Argentine Great Western. Here we have a line almost on a parallel of latitude nearly to the frontier of Chile. Again we note the regular slope of the Pampa westward, until the country begins to swell into the Cordova sierra. Thence to Mendoza it is broken.

Section 5 shows the Bahia Blanca and North-Western Railway, as far as Toay, and thence its proposed extension to Villa Mercedes. It traverses a district, the southern half of which has apparently been much troubled in former times by water, wind, and sand. From Victoria to Villa Mercedes the country assumes a more uniform slope; but, beyond that, to the north, it rapidly rises into the barren, mountainous districts of San Luis and Western Cordova.

Section 6 is the Central Argentine railway, Rosario to Cordova. This is of interest as showing how far the uplifting of the Cordova range extended east, and nearly divided the Pampean sea into a great northern and southern section. In fact, this railway is the southern border of a belt of rounded-up country, extending from the Cordova sierra to within 30 to 40 miles of the river Paraná.

Section 7 is from Bahia Blanca north to Villa Maria (say 482 miles), thence to Cordova by the Central Argentine line, thence to Tucuman by the Central Northern section of the Cordova Central railway, and thence to Jujuy by the Government railway—a total length, nearly south to north, of, say, 1127 miles. This section presents some notable features: between Bahia Blanca and Carhué it crosses the extreme western slope of the Curamalal sierra; thence to Villa Maria it shows an almost level stretch of Pampa, the lowest part of which, near Trenque

Lauquen, is only about 300 feet above sea-level. This depression is on the parallel of Samborombon bay, down to which it gradually slopes in a distance of 300 miles. From Villa Maria to Dean Funes the line ascends the Cordova mountains, a marked feature of which is their bold western escarpment, overlooking the profound hollow which separates them from the south-eastern spur of the Catamarca sierras. In this depression lies the Salina Grande. From Tucuman to Jujuy, near the Bolivian frontier, the country rises rapidly towards that mountain bastion which is thrown so far east from the Pacific Ocean, and which is the true heart of the Andes. During a ride from Jujuy to Potosi, I could not avoid being impressed with this mighty swelling up of the continent; and on several occasions, especially looking eastward, I was convinced that I could see the curvature of our globe.

Section 8 is the Buenos Ayres Western Railway. It stretches south-west across the heart of the true Pampean plain. The regularity of its gentle slope is remarkable.

Section 9 shows one of the lines of the Southern railway, from Buenos Ayres to Bahia Blanca, and the gradual rise of the country south-westward, up the slope of the Curamalal mountains.

Section 10. This is of great interest. It starts at the Atlantic coast, and is roughly parallel to, and south-west and west of, the Plata estuary and Paraná river, and from 70 to 100 miles distant from them, until reaching a point about 100 miles above the mouth of the river Pilcomayo; thence to the great gap, between the Bolivian Andes and the Chiquitos sierras, and thence to the lip of the first fall of the river Madeira—a total length of about 1770 geographical miles (about 3300 kilometres). This line, from the great gap to the Atlantic coast, was approximately that of least resistance to the flow of the Pampean mud. I have called attention to the very gradual north-eastern swell due to the Cordova sierra. This section clearly shows it, and indicates, moreover, that the Salado, or Juramento, river flows along its lowest margin, and serves as the boundary of the most southern part of the Gran Chaco. In fact, the Salado occupies the south-west side of a very level depression, 300 miles across, and only 240 feet above the sea, along the north-eastern edge of which runs the Bermejo. The northern undefined limit of the Gran Chaco is probably the Chiquitos sierras. From the Bermejo, northward, the section shows the slope of this Chaco district. It is the natural incline which the waters gave it as the sand was poured in from the north.

I have been obliged to estimate the height of the present water-divide between the Plata valley and the Mojos basin. For the first 240 miles north of the divide I allow a slope of 9 inches to the geographical mile, and thence down the Mamoré river to the present lip of the Madeira falls, a descent of about 4 inches to the mile. Like Keller, I found the Mamoré to be a very sluggish stream, "the inclination very small." Barometric measurements I could not take, owing to the failure of some instruments and the loss of others. The height of the upper fall of the Madeira is shown to be 547 feet above the sea. It has served as my starting-point in estimating the summit of the water-divide at 817 feet. Minchin gives a few widely separated barometric measurements on his map of the neighbouring country to the east, and I judge that he makes the divide perhaps 100 feet higher than I do. I should be glad if so able an engineer would give us further information about it.

Formation of the Bed of the Pampean Sea.—A vast area of the Plata valley is covered, to a depth of from 20 to 100 feet, by a bed of reddish-yellow, semi-plastic, argillaceous earth, varying in colour, hardness, and constituent parts. It is mixed with a little sand, and has traces of titanic iron and olivine. Due probably

to underground percolation from the lime-carrying rivers, it frequently merges into a marly rock full of calcareous nodules. This rock is found over immense areas of the country, and is at times apparently stratified. Great numbers of the *Calomys Biscacha* burrow in families under the rocky caps which are near the surface, and thus expose them to view. "For this reason," according to Heusser and Claraz, "the Pampa Indians call the hard material 'trui-cura,' or Biscacha stone (*trui*, Biscacha; and *cura*, stone); but the country people have given it the name of *tosca*, of which the literal translation is tufa, whether it be the bed itself or the calcareous nodules contained in the clay. The Pampas are entirely without stones or pebbles. In general the Pampa clay becomes more and more sandy as one goes west. It is the same towards the south, starting from the Quejen Salado. There is much gypsum and carbonate of lime in the deposits, and much fine *débris* of a volcanic nature."

In 1859, in a small cave excavated under a *tosca* cap at Nueva Roma, northwest of Bahia Blanca, I found stalactites from 6 to 12 inches long. Pelleschi tells me that at Puan, where a small stream has cut out a bowl-shaped depression (785 feet elevation above the sea by instrumental survey), there is a cap of tosca covering the district which is well filled with shells, closely cemented, but he does not know the species; and that, on an inland in a neighbouring lagoon, excellent lime is made from a limestone rock found there.

A broad saddle of Pampean formation lies at an elevation of over 600 feet between the Ventana and Tandil ranges. The *tosca* rock is almost everywhere *en évidence* in the sloping plain which surrounds the Ventana and Curamalal ranges, and it is extensively exposed in the banks, and at the rapids and falls in all the little streams. I have noticed that, where these run over *tosca*, it has a hardened surface for a depth of perhaps half an inch. This is due to the hydraulic properties of the rock, which have in places been found so marked, notably at Rosario, in Santa Fé, that a few years ago, Carrasco states, the beds were worked for the manufacture of hydraulic cement.

D'Orbigny, Darwin, Bravard, Sir Woodbine Parish, Weddell, Heusser and Claraz, and others, disagree as to the origin of the "Pampean mud." Darwin wisely said, "it poured down from the north;" but the then paucity of geographical knowledge regarding the interior of South America did not enable him to fix its exact source and method of conveyance. Embedded in the Pampean formation, over widely extended areas, have been found the fossil remains of the mastodon, megatherium, mylodon, and other gigantic animals, those from Rosario to the south being mixed with shells of species still living in the neighbouring seas. After the Pampean beds were formed, and their southern and eastern margin began to emerge from the waters, the ocean along the shallow coast roiled up on the gently inclined plain quantities of shells, banks of which, miles in length, may be seen to-day far inland, giving evidences, by their curvature and general appearance, of having been piled up along an ancient coast-line.

Not far from Bahia Blanca I have ridden for miles along the top of one of these embankments, about 20 feet high, and 100 feet wide at the base. Most of the shells had been broken by wave-action, and were mixed with abundance of rounded pumice, which probably floated down the Colorado and Negro from some volcanic centre of the distant Andes.

But a portion of the Pampean formation is still submerged, for tosca rock may be found throughout the length of the Plata estuary forming the bottom of its southern half. Thence it extends its eastern and southern margin under water, along the coast of Buenos Ayres, at least as far as Bahia Blanca.

The *savants* whom I have named have presented us with abundant evidences

that the whole Pampean formation was once submerged. What appears to have confused them is the finding of similar beds in widely separated localities, and at elevations varying by thousands of feet. One may believe that wherever, in the immense drainage area of the ancient Plata basin, the conditions of rivers, lakes, and inland seas were favourable to the distribution of silt from the mud-producing rocks which margin the entire basin in such prodigious quantities, there the "mud" should be found; and it is conceivable that even to-day, if Nature were to form a lake by throwing a permanent dam across the entrance to an extensive valley leading into that basin, the streams entering it would there deposit Pampean mud. If this be true, there is no reason why such mud should not be found resting immediately on crystalline rocks in places. The extent of any continuous bed would alone be limited by the drainage area receiving the silt. The origin and age of a deposit, wherever found, be it at sea-level or 12,000 feet above, or be it a square mile in area or 100,000 square miles, should be treated upon its individual merits. Darwin alone appears to have entertained doubts as to the contemporaneous origin of all materials similar to the Pampean beds, attributing their uniformity more to "the similarity of the rocky framework of the continent."

The Pampean sea connected with the Atlantic ocean between Uruguay and the Tandil Sierra. It was probably about 1400 miles in length, with an average width of above 400 miles. Roughly estimated, its area must have been about 600,000 square miles—say about two-thirds the size of the Mediterranean sea. The area of the ancient Mojos lake was about 115,000 square miles, being seven-tenths that of the Black sea, and exceeding that of the five "Great Lakes" of North America, which is 93,581 square miles. The relation of the Pampean sea to the Mojos lake was similar to that of the Mediterranean to the Black sea. Traces of it are still observable, notably the great, low, flooded morass of Xarayas on the upper Paraguay river, and the ancient delta of the Paraná, including the Ybará lagoon. The Salina Grande was also an arm of it—a great inland fiord. The sea, moreover, must have covered large areas of Paraguay, Corrientes, Entre Rios, and Uruguay, and, before the uplifting of the country, it extended south-west to the rivers Chadi-Leofu and the Colorado, lapping round the southern slope of the Ventana range until the curved rim, concave to the north-east, which connects this with the Sierra de Cordova, was sufficiently elevated to completely cut off its south-western extension. This rim, for the first 50 miles, starting at the Ventana, is about 700 to 750 feet above the sea, and shows much tosca rock near the surface. It afterwards rises rapidly towards the Cordova sierra.

The Uplifting of the Pampean Beds.—The Pampean beds were apparently laid down in shallow water. Their present irregularity and elevation may be attributed to pronounced local uplifting, followed by an extremely slow general upheaval of the Andes from west to east, which was communicated to the whole bed of the Pampean sea, raising it ultimately to its present level. Gradually, as the Ventana, Tandil, and Cordova sierras were lifted, the mud settled upon their slopes until they ceased to exist as lofty islands, and with their connecting-rim of high ground formed a vast breakwater against any inroad of the ocean from the south or south-west. South of latitude 30° the force which raised the Andes has not shown the same vigour which it has to the north of that parallel, where it appears to have been greater in proportion to the broadening and swelling up of the mountain masses. As a resultant of this and its slope to the eastward, the northern section seems to be upheaved from the north-west, while, southward of lat. 30°, the real west-to-east action is apparent. Here the great distance of the Atlantic coast from the Andes has caused the eastern part of the province of Buenos Ayres to be raised but little, not sufficiently to lift the Pampean beds

entirely out of the sea. In the north the gradually decreasing distance between the Cordillera and the Brazilian highlands confined the force and gave the plain its maximum lift at the great gap, at about 18° lat., where the leverage of the Andes must then have ceased, due to the fact that, at this point, they take a sharp turn to the north-west, leaving the basin of the Beni and Mojos undisturbed.

This local and general upheaval determined the course of the Paraguay, the lower Paraná, and the Plata rivers, which were naturally pushed over against the more ancient Brazilian formation. It also, as the Pampean sea retired, caused the Pilcomayo and Bermejo to take their south-east course across the Gran Chaco and find their present outlet.

The Cordova range has lifted the Pampean mud to an elevation of about 1300 feet above sea-level.

The Tandil range has brought up, to a height of 900 feet, beds identical with the Tertiary deposits 100 feet below the surface at Buenos Ayres. This indicates an upheaval of 1000 feet since Tertiary times.

Lying between the Bermejo river and the Salado, say the southern third of the Gran Chaco, we appear to have an almost undisturbed part of the bottom of the ancient sea—the present boundary belt between northern and southern climatic influences.

Age of the Pampean Formation.—The United States engineers, Humphreys and Abbot, estimate the amount of silt discharged yearly by the Mississippi river to be one cubic mile in twenty-two years. Although it carries, per cubic foot of water, much more silt than the Plata, I doubt if it exceeds that of the river Madeira, which now drains the Mojos basin, and is a very turbid stream.

The mean flow of the Mississippi at New Orleans is 675,000 cubic feet per second, but its maximum at flood is about 1,000,000. The minimum flow of the Plata, past Buenos Ayres, is 534,000, the maximum 2,145,000. It may, therefore, be fairly assumed that the yearly flow of the great North American river is not superior, and may be inferior, to that of the Plata; and if it be admitted, as I believe, that the Madeira branch of the Amazon, at the falls, annually carries an amount of water equal to that passing Buenos Ayres, it will be evident that the total cubic volume of the streams which poured into the Pampean sea must have been equal to twice that which the modern Mississippi contributes to the Gulf of Mexico.

Estimating the Pampean mud to cover an area of 400,000 square miles, with an average thickness of 50 feet, it would represent about 4000 cubic miles of silt. The Andean and Brazilian shales and sandstones were probably disintegrated and dissolved with great rapidity when the rivers which tore them down flowed into the Pampean sea. These streams must then have carried, one with another, a quantity of silt which, compared to that carried to-day by the Plata and Madeira rivers, may safely be estimated at three-fourths the amount per cubic foot of water now carried by the Mississippi river. Allowing for partial loss of silt in the ocean, and from other causes, this would give the Pampean formation an age of about seventy thousand years.

How the Ancient Mojos Lake was formed.—I find the *divortium aquarum* between the Mojos and Plata basin to be only about 170 feet higher than the ancient lip of Guajará-mirim. It is easy to understand that the Rio Grande and the Parapiti have deposited there a quantity of alluvium far exceeding 170 feet in depth. The divide, prior to this and to the general uplifting movement described, could not have been more than 200 to 300 feet above sea-level, and thus much lower than even the present lip of the upper fall of the Madeira. Therefore through this southern gap the combined streams which now form the principal affluent of the river Amazon found their way. Slowly the highly charged,

yellowish-brown waters sifted out and spread their heavier material over the sandy slope at the head of the Pampean sea, leaving the fine silt in suspension to be precipitated over the submerged plains. The waters from the north were augmented in turn by the Paraguay and Paraná, the Pilcomayo, Bermejo, and Salado. From east and west numerous rivers pushed into the sea, stirring up its waters, and thus keeping the greater part of the silt in suspension to be carried far southwards and deposited, principally, and in maximum thickness, over the Pampean region south of lat. 30°.

The Grande and the Parapiti entered the plain with a northern trend to contest with the great river of the north the possession of the gap. They struck it almost at a right angle, and slowly pushed their rival eastward over against the Chaco base of the Chiquitos sierras. Here the final conflict must have taken place, as the Grande and Parapiti threw their dam across the outlet of the Mojos river, thus cutting off its exit into the ancient sea. No doubt the giant stream waged fierce war for thousands of years to keep its channel open, alternately sweeping away the barrier and again yielding to the ceaseless volume of sand and clay which, visible to-day, confirms the victory of the Grande and Parapiti. The dam having finally become permanent, the formation of the ancient Mojos lake was assured (see physical map). When it reached the level of the lip of Guajará-mirim, its waters commenced to tumble over it and carve their way to the Amazon. Since then huge volumes of alluvium have poured down the northern slopes of the Bolivian Andes; the ancient lake is now almost loaded with material, but is not yet entirely obliterated. The muddy silt which covers the surface of the basin is so fine that, when an Indian goes up-stream to the mountains, his friends ask him to bring back a stone that they may see what it is like.

Since forming the dam, the Rio Grande has slowly been returning westward down the counterslope which its own alluvium creates.

Slight Tidal Action of the Pampean Sea.—Off the mouth of the Rio de la Plata, the tides which flow south along the Brazilian coast meet those making north from the coast of Patagonia, counterbalance each other, and maintain the liquid mass at nearly the same level, so that the average tide at Montevideo is only about 3 feet. Thus the Plata river is able to pile its silt in a direct line further seaward than either the Orinoco or the Amazon. I have shown that the Ventana range acted as a massive breakwater to the Pampean sea, and that the Cordova sierra almost divided this into a northern and southern half. Hence the prevailing conditions appear to have permitted but little tidal action in the great basin. Had it been otherwise, as, *à priori*, one might suppose, the fierce contests which the tides would have waged when meeting the large rivers would have ripped up the Pampean beds and washed them into the ocean, and, in their place, we should now find nothing but a clayey, sandy, and shingle-covered waste.

In 1860 I located the northern railway from Buenos Ayres to San Fernando. An extremely violent "Santa Rosa gale" swept up the Plata estuary. Finding by actual measurement that when its waters drove against the outflow of the Paraná river they tore 17 feet in one day into the high tosca bluff of San Isidro, I carried the definitive location over the hill instead of round the point at river-level.

The Inter-Andean Region.—The eastern inland Cordillera of the Andes which overlooks the Gran Chaco is separated from the Pacific coast range by a desert, bare, and almost waterless belt of mountainous lands, from 250 to 300 miles wide, through the heart of which I have ridden. An extraordinary parallelism exists between the numerous lines of sierras, mostly running north and south, which fill the space. Between them are deep, scooped-out depressions, sometimes containing salt lagoons. On the rare occasions of violent storms, these receive torrential

streams from channels which ordinarily carry but little water, and many of which are dry for most of the year. The whole district appears to be a southern prolongation of the Titicaca basin, and possibly may have been so before the Andes reached their present elevation. As it extends southward it grows lower and less broken, and the *salinas* occupy a larger area until, to the west and north-west of the Sierra de Cordova, they are of enormous extent; but as latitude 30° is passed, the eastern slope of the now narrow Andean chain begins to receive a sufficiently increased rainfall to supply the waters for the western system of Argentine rivers which try to find their way southward to the river Colorado, but which they only reach at rare intervals, when some exceptionally heavy storm aids their effort to satiate the sandy, thirsty desert which they traverse. This area of about 250,000 square miles (not a very comfortable country to march an army across) frequently presents evidences of marine action on a grand scale. D'Orbigny, Darwin, De Moussy, and Burmeister allude to the accumulations of rolled shingle found in the valleys and at the base of the mountains. Darwin speaks of the ocean as having "long acted at the foot of the eastern Cordillera at nearly the same level as on the basin plains of Chile, and that the origin and transportal of these vast beds of pebbles is an interesting problem." Perhaps a thorough study may show that the Patagonian gravel beds—76,000 square miles in area and 50 feet average thickness—were, like the Pampean deposits, in great part derived from the north. For reasons which I shall explain, I believe that all of this terribly eroded, inter-Andean district once had an abundant rainfall, and that, after the heavy material from the mountains had been sorted out, the rivers carried to the plains, to the west of the present province of Buenos Ayres, immense quantities of sand and clay derived from the masses of gneiss, schists, sandstone, and calcareous rock through which they flowed. For this reason, to the west of the curved boundary-line of the Pampean beds, between the Ventana and Cordova sierras, the lands are dry, sandy, and uninviting.

The contour-lines of the country around the lower Colorado appears to indicate that the river once emptied into a broad, shallow estuary, which penetrated inland from the present coast-line about 116 miles. Over its bottom the Colorado dropped its silt, similar to the Pampean mud, but more siliceous. On what was once its northern shore, it is not surprising that Darwin should find "an accumulation of high sand-dunes, ranging westward from the coast twenty miles distant," and which he believed "were formed on the shores of an estuary." It probably included the present Bahia Blanca and its coast-line as far as Mount Hermoso, to the east of Punta Alta, where Darwin found so many fossil remains of gigantic mammifers. May we not suppose that these came from the north, were floated down the Colorado, and taken to this point by the northern currents which swept along the Patagonian coast?

Climatic Influences.—It must be admitted that an ancient sea two-thirds the size of the Mediterranean, and a lake much larger than the total area of the "Great Lakes" of North America, must have profoundly affected the climatic conditions of the adjoining regions. Perhaps no part of the world presented an example where the forces of Nature had an opportunity to display their power in equal magnitude, over such a continuous area, and with such uninterrupted simplicity. To the west, the Andes served as a lofty condenser, which, for a distance of over 2500 miles, guided the cold polar currents towards the equator and safeguarded their vigour. Similarly, the Brazilian highlands largely confined them to the great valley as they swept northward to do battle, in the heart of South America, with the warm vapours generated from the Pampean sea and ancient lake, and the steaming, tropical basin of the Amazon. The extension of the vapour

belt southward towards the Atlantic ocean carried the equatorial currents nearer to the polar ones, thus inviting frequent atmospheric disturbances and resultant storm action. As the hot, vapour-laden winds, fertile in elements and force, met the southern cold ones, a prodigious amount of heat was set free by condensation. Into the vacuum thus created the opposing currents rushed with ever-increasing rivalry, enlarging the area of mechanical action, condensation, and vacuum, and augmenting the violence of the storm-waters, which, sweeping along the mountain slopes, must have rapidly disintegrated and eroded them, and have acted as a potent agent to transport to their base much of the material from which the Pampean beds were sifted. The rainfall over the inter-Andean region must have produced many large lakes similar to Lake Titicaca, and a great river system, which, tributary to the Colorado, swelled it into a stream of the first rank, pouring into it the sand and silt which have completely filled the enormous estuary, the outline of which is still traceable.

One may believe that an increased rainfall gave a luxuriant vegetation, where herds of gigantic mammalia found feeding-ground; from which, from time to time, they were swept, by storm or swollen river, into the Pampean sea, where also they may have lost their lives in other ways, their remains being distributed over it by the currents.

To a minor degree the ancient sea and lake must have affected the inter-Andean climate, from Cuzco to the south, throughout the lacustrine basin of Titicaca, giving it greater rainfall and fertility than it now has. Geological examinations show that Titicaca was once one of the large lakes of the world, and that it has slowly been drying up. Does its gradual diminution date from the disappearance of the Pampean sea and Mojos lake?

Savage man may have lived in South America on the mountain slopes round the ancient sea. If so, he possibly hunted the mastodon, the megatherium, and numerous other of the gigantic fauna which probably were co-existent with him. His only highway, between the eastern and western halves of the continent, must have crossed the elevated region at the head of the Pampean sea, lying between 17° and 19° S. lat., which is still the only route in use for communication by land between Bolivia and Matto-grosse.

A GREAT GLOBE.*

By Professor ÉLISÉE RECLUS.

RECENTLY being in conversation here in London with a traveller and discoverer, I mentioned the great geographical importance of accurate representations of our planet in the shape of globes; suddenly he interrupted me, and said with a smile, "What is the use of your Lilliputian globes, ten, a hundred, or a thousand yards thick, when you have the very globe itself, our good and beneficent Earth, to walk over, to look at, to study, and to love?" Of course I laughed, and thought with him that all representations and symbols of life are very little in comparison with life itself: our works are small when contrasted with nature. But the great man who thus spoke in joke knew as well as I do, the value of scrupulous effects in geographical work. He has himself drawn very useful maps, which enable us to follow him in his great travels. We cannot all perambulate the surface of our planet, but we may still be very useful in a secondary way. The great question is to know in what direction

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we are to exert ourselves in order to produce the greatest amount of perfect scientific labour. The chosen few will make discoveries; the others, less fortunate, but happy still, will follow in the track opened to them.

One of our eminent geographers, who is present at this meeting, Dr. Hugh Robert Mill, gave us, a few years ago, a lecture on the "Geographical Work of the Future," and put great stress on this, that "accurate cartographic representation is the very essence of geography." Certainly he was right. Accuracy of design is of paramount importance, and this is the reason why geodesists measure the surface of the Earth with such wonderful care and precision: a difference of a few millimetres on two measurements of a line of base is justly a great matter of discussion, and obliges the scientific bodies to begin the work again. Thus a perfect exactitude is obtained in geodetic calculations, and the real distances and proportions of all geographical features are triumphantly made out; but the results, although fulfilling all expectations and perfect in registers and tables, are in a certain measure practically lost on the deceitful maps and charts: there truthful representation is quite out of the question, at least for all parts of the figure which are not delineated on the centre of the map. A plane surface never will nor can be the real representation of a spherical surface. Splendid devices may be imagined by the mathematicians to lessen the importance of errors according to this or that dimension of the map, but although I do not deny the immense conveniency of maps, without which there would be no geography at all, still we may point out the errors which will subsist, and sometimes we feel tempted to ask, "What's the use of having secured perfect accuracy in measurement, within one millimetre, when on paper the errors must amount to yards, furlongs, and miles?"

There is only one way to represent truly the surface of the Earth. Curves are to be translated in curves; a sphere or fragment of a sphere must be reproduced by another sphere or fragment of sphere. Therefore are we really astonished that public attention and the special care of geographers are so little attracted towards this logical mode of geographical work.

The progress of cartography proper has been really immense. When we compare the maps and charts which are now constructed by the various industrial, maritime, and military staffs with the very interesting maps of the last century, which had been also constructed with great care by the best geographers and at very great expense, we are struck by the marvellous increase of those documents, not only in quantity, but also in quality. I may say that certain maps, where the scale is very large, and which, in fact, may be considered part of an immense globe, are at the same time so gloriously embellished by colours and graduated tints that they are really wonderful to look at, both as true representations of nature and as marvellous works of art. The impression which genuine geographers feel is very near or even entirely similar to that of an artist before a glorious picture or statue. To see nature itself, and to behold at the same time a picture of it in perfect accordance with the reality, is positively a rapture. As examples, there are the official maps of Switzerland or the Bay of Naples.

But, returning to sphærography, we must avow that there are very few globes or segments of globes which have been made with sufficient care to be held in comparison with the best charts. Generally they are much less scrupulously drawn, being constructed more for show than for science; they are less worthy of attention. Of course, some of the elaborate globes which have been issued by various publishers are altogether very creditable objects, but few are to be studied with the same confidence as maps in almost all civilized countries. Some of the globes which have been constructed are huge in dimensions. There is one cut in a rock, I believe, on the seashore near Bournemouth, but I don't know if it has any real

value. There was one at the last Paris Exhibition which was some 120 feet in circumference, being one-millionth of the mother Earth to scale, and I must say this gigantic globe has left on minds of the three hundred thousand people who saw it a very deep impression, by the mere comparison of dry land and sea, and the large proportions of countries which are ordinarily shown in Lilliputian forms in most atlases. I remember, also, the real feeling of rapture which pervaded me when, in my youth, I walked inside of Wylde's globe, near this very place, admiring the magnificent sight. But that noble structure, as well as the Paris Exhibition globe, made no pretence to accuracy in geography proper; they had been designed only to be looked at from afar, without any special study of minor details.

The Paris globe was to be seen from the outside, on a winding staircase; the London Wylde's globe, forgotten now by our contemporaries, was seen from the inside, and was to be contemplated at one circular glance. According to Alfred Russel Wallace, whose opinion has such great weight, the last method would be really the best.

I repeat it again, this department of geography, sphærography, although the most important to develop, has not kept pace with the other, cartography, and I presume it will be a real revolution when it has taken in science and practice the paramount place it deserves. At present small globes are very much in use for schools, but we know how that part of the educational furniture is shamefully neglected; the very fact that it is found in elementary classes is one cause of the disdain in which globes are generally held. There is, perhaps, another reason. Globes of large proportions are very cumbrous objects, and in our crowded cities, where space is so expensive, it is very difficult to find place for these scientific guests. And, above all, the best of reasons is that education has not been yet directed in that way, and people, even scientific people, are not yet sufficiently convinced of the absolute necessity there is to study geography on images of our planet reduced to a commodious scale and with the real proportions. There is no geographer, however learned and accustomed to the reading of maps, who is not constantly at a loss to understand immediately, at the sight of charts drawn on all kinds of scales, what exact proportions the country represented bears to his own land or district. He will not see the real state of things; he will try to remember the figures he has learnt by heart, or make tedious calculations, which are a great loss of time.

So it is that for us all, learned or unlearned, the direct study of geography on spherical surfaces is absolutely necessary. If the scale of the globe is very small in comparison to the real dimensions; if it is, for example, in the proportion of only one to 10 or 20 million, then the surface is to be kept even—polished, we may say—because the roughness of the highlands and mountains cannot be represented with sufficient relief. On such a ball, 6 or 12 feet in circumference, the highest mountain of Himalaya would not represent $\frac{1}{25}$th of an inch in height, and the ordinary hills would hardly alter the regular surface of the globe. But, with larger spheres or fragments of spheres, another element of truth and beauty is added to the construction; the actual relief appears on the curvature of the model.

And here allow me to say, once for all, that the system of exaggerating the proportional height of hills and mountains on the surface of globes is utterly bad, contrary to real science, and ought to be discouraged by all geographers respectful of nature and its laws. In that way the utmost ugliness is attained; people who do that kind of work seem to think themselves above all sense of reality. Thus we hear that the ladies of the Philippine islands, wishing to make a valuable present, imagined to have a representation of their archipelago made by a jeweller

with rubies for the cities, sapphires for lakes, and other costly stones for volcanoes. Of course, many thousand pounds were expended for that miserable rubbish.

All the pseudo-relief maps which show us slopes with two, three, fifty, one hundred times their real proportions in height, inconsistent with the facts, and violating the forces of gravitation, are the logical consequence of a childish desire to represent grand sights as if they were always stupendous, wonderful, next to miraculous. It is in the same spirit that, during the first part of this century, before the invention of photography, painters were prone to exaggerate in their pictures twice, or even three times, the real proportions of mountains in altitude; conscious in a certain measure of the deficiency of their art, they relied on falsehood to make it more eloquent. Happily, new discoveries have enrolled the sure, the victorious light of the sun on the side of truth, and now we have by thousands and by millions splendid pictures of mountains, which give to our eyes the true sense of proportion, and certainly do not diminish our conception of beauty.

The revolution which photography has accomplished in pictorial art is to be achieved also in relief construction. We are to be most strict in one thing—keep always to the truth. It is the best plan in scientific work as in life. Truth in scales: therefore it is that we must use globes instead of maps as frequently as possible. Truth in heights of relief: therefore do we leave entirely out of question the idea of showing any apparent roughness on globes or fragments of globes under the scale of one-millionth. On such balls colours and shades only will be convenient to represent the various altitudes on the Earth and depths in the sea.

But as soon as the globe or fragment of globe is large enough to show at least one-millionth part of the Earth in real proportions, then we may try to represent as well the heights and depths as the planimetric dimensions. Of course, the chiselling and moulding of the surface will be more and more elaborate in proportion to the increase of the scale. On a globe of one-millionth, the great masses of highlands and mountains, 3000 feet in height, will hardly appear above the plains, and only by the contrast of light and shade; but summits of 10,000 or 12,000 feet will be seen perfectly well—the more so, that to show forests, pastures, snow or ice, various colours and tints will heighten the effect as they do in reality. It the size in diameter be doubled, the impression of the sight is increased, and the relief is represented with much greater accuracy. If you construct a very large globe on the scale of 1 to 100,000, then all the details of elevation and depth will appear most distinctly, even hills and hillocks 150 feet in height. You see the very Earth as if you were sailing above it in a balloon. The representation of such heights, whose appearance our eyes are accustomed to, gives us an unexpected advantage by furnishing us with a standard of comparison. To give us an idea of the real height of a building, photography and painters put men or women standing all around or leaning against the pillars. Thus spectators of a relief will easily estimate, by comparison with known heights, the real dimensions of the hills and mountains which diversify the surface.

There has been in Switzerland lately a very interesting public controversy. A skilful cartographer and relief maker (M. Charles Perron) had proposed to the Federal Council to construct, for the Paris Exhibition, a relief of Switzerland on the scale of 1 to 100,000, which, he said, would do honour to the country; and, indeed, the samples of the work which he exhibited at Bern and Geneva excited general admiration. Evidently the undertaking deserved to be encouraged, and it would have been taken under the official patronage of the Swiss Republic if a few influential geodesists had not interfered, asserting that a true and perfectly detailed representation of nature wanted a larger scale than the 100,000th. As in examples of their contention, they referred to the parting of slopes on nearly horizontal ground;

the geographical changes brought in the configuration of a valley by the advance of a morainic ridge; the displacement of the courses of rivers caused by landslips and erosions—all facts of small magnitude in their origin, but of great geographical importance, and which are to be fully represented on large relief to be clearly understood. Pamphlets and articles were published on both sides, and the question was fully elucidated by most competent scholars.

Now we may resume the discussion. According to the effect which must be attained, and the elaborate study which is aimed at, scales must be different in globes, as also they are in all other modes of representation, maps, charts, and plans.

If our intention is to show the majestic appearance of the Earth, with its continents and seas, with its mountains, rivers, and plains, if it is to give a perfect idea of the interaction and interdependence of all organs in the grand planetary body; then, by all means, let us construct a large globe, where we may be impressed by the mass itself, by the harmonious forms of the countries we know, and specially love and study. But if our aim is to show the details as thoroughly as possible, and the means be not sufficient to construct the globe at a convenient scale, the only way is to model fragments or parts of sphere in proportion of 1 to 50,000, 25,000, 20,000, 10,000, 5000, as may be desirable. With the increase of these treasures, geographical societies will acquire documents enough to represent in reality whole parts of the Earth in miniature, attaining the utmost perfection, and satisfactory both to the learned and the artists.

This is, in fact, the thing which will be done in Switzerland. Two objects are to be attained, and therefore work will be directed in both ways. I hear M. Perron's great work will be pushed on with great enthusiasm, and we may hope to see, two years hence, in the Paris Exhibition, his complete relief of Switzerland on the scale of 100,000—the most complete, and certainly the best of the kind, which geography will possess; and, on the other side, all those who have carefully inspected the Polytechnium in Zürich know what splendid achievements local geodesists have made in the shape of mountain-reliefs on very large scales, showing and explaining at the same time the features of the country. Nowhere in the civilized world do we find so much and so great work accomplished in the way we recommend.

Among the conquests of a proximate future, I think a better division of labour will be introduced in geographical bodies. Already a very great improvement has been made in the scales of maps, especially for large geographical works. Nearly all these are now constructed according to a scale with very convenient decimal numbers, 100,000, 50,000, 40,000, 20,000, which allow us easy arithmetical comparison, all numbers being a multiple or a decimal fraction of another. The United States squeezed, so to say, between two tendencies, to measure still in the ancient way, by inches or parts of an inch to the mile, or to deal with great decimal masses, have chosen for their maps the various scales of 250,000, 125,000, and 62,500, which last measure is so very near to the proportion "one inch to the mile," that it may be considered as practically the same. In reliefs, even more than in maps, the habit has become general to take regular scales with full thousands and tens of thousands; thus comparisons are more easily made between the various productions. This tendency of relief-makers will, I hope, grow more and more common, and gradually, by mutual, though informal, agreement, their works will be made according to a few commodious patterns, and constitute as many different parts of great globes constructed on the same scale. If all these disjointed and scattered parts, well reproduced and regularly exchanged between the authors and the geographical societies, were collected and put together, the construction of entire globes on very large scales would be found very much

advanced. People would be astonished to see what large fragments of continents in relief we already possess, if they saw in a great hall, put in their proper place, all the plans of the Alps, Pyrenees, and Auvergne, and other mountainous lands. These relief constructions on large scales are the necessary complement to the lesser globes, for whose construction we plead urgently.

This spontaneous organization of labour which pervades the scientific workers in the common field will prevail more and more. We see already the various geographical societies uniting every year more intimately to distribute the business among themselves. Small societies have their very important part for local efficiency, and we may expect from them searching studies on the special questions relative to their own or surrounding countries. Larger bodies residing in important seaports or commercial centres have a greater field of action, and their natural circle of study embraces especially the parts of the world which belong to the general market of their cities; lastly, the societies, whose area of action and reaction is the immense world at large, are invested with a mission of high and noble import—to centralize every document belonging to the Earth at large, and to any part of it specially; to collect in their libraries all the books, all the pamphlets and documents, that have been written or published anywhere in the world; to have the entire set of maps, charts, and plans which have been constructed and drawn by geographers and engineers in the entire world; and especially to offer to their guests, who are, so to say, the delegates of all mankind, a model of the Earth, under the shape of a globe, vast in dimensions, where every man will find himself at home, and even will learn to know his own country better than before, where he may also indicate all possible corrections and improvements;—such a model, in fact, which will afford a standard of scientific perfection which human intellect and skill are able to attain. This is, I think, what the legitimate ambition of a geographical society ought to realize, and will certainly realize, in the proximate future.

Among all the riches which I foresee in our palaces and museums on geography, there is one, as is implied in the subject of my lecture, to which I look forward with an intense desire. Now, at a time when every morning and evening newspaper brings us news from all parts of the world; when every one of us, even the least fortunate, is fed and clothed with productions of all continents and seas; when we all have friends across both oceans in the antipodal countries;—the moment has come for us to have grand representations of our common home, and not to satisfy ourselves with petty spheres, round copper balls, similar to that which Krates of Melos exposed to the curiosity of men in the temple of Pergamos, twenty-one centuries ago. Now Globes must be temples themselves, as well by the magnificence or proportions as by the beauty of workmanship and the scrupulous care of scientific drawing. In sight of such constructions, people must feel grave and respectful, not only because those monuments consecrated to science will partake of its majesty, but also because they will belong to all men, without any privilege for race or nationality, and will help to strengthen within us the feeling that we are one and the same family.

Before the reading of the paper, the PRESIDENT said: We have with us this evening one of the most celebrated and eminent geographers now living, M. Élisée Reclus. He has come amongst us to give us his views respecting the use of globes. I now request M. Reclus to read his paper.

After the reading of the paper, the PRESIDENT said: I have no doubt several geographers will wish to discuss this extremely important paper which M. Reclus has just read to us. I will first call upon Prof. Geddes.

Prof. GEDDES: In these days of peace and war, I do not think that we need

insist upon the practical importance of such a globe as is suggested by M. Reclus. We all want to see large maps and their relations to one another. As regards the more purely intellectual uses of M. Reclus' globe, while he has been speaking I have been thinking of Mr. Herbert Spencer, and how both the concrete and the abstract mind are each working out their own view of the world into one great unity. Again, as to its use in education. M. Reclus' assistant paid us a visit the other day in our own college. He came to us and described the project which his chief has outlined in greater fulness, and to this little meeting there came all our own professors—the mathematician, who happened to be a practical constructor of reliefs; the engineer, who happened to be deeply interested in the question; we had the physicist and the chemist, the zoologist. It also brought the lecturers on history and classics, each showing, from his own point of view, his interest in the construction of M. Reclus' globe. Here, then, is a little example of how such a project immediately tends to bring the educational machinery of so many departments, and of all kinds, into an active and real co-operation. And if I had any doubts before, I had none afterwards, that such an undertaking would stimulate the universities and colleges and all the schools, and help the labours with which Dr. Keltie is so eminently associated, those labours for the improvement of educational methods of teaching geography; for the globe scheme would co-operate very widely with the whole movement of geography from the universities to the elementary schools. I do not think I need argue much in favour of the project. I should like to say that it would be a pity for such a meeting to disperse without some kind of practical outcome to it; and, if I may go still further, it seems to me that a meeting of this kind has nothing to do with questions of sites or finances; but it has to do with the scientific and the constructive problems. I presume it is an open secret that if M. Reclus chose to carry out his undertaking on lines of popular amusement and advertisement, it might have been carried out a long time ago. But M. Reclus has maintained a strict attitude in this respect. Serious and practical geography demands, therefore, that it is necessary for scientific men to help him to maintain this attitude, and not to vulgarize science by making a vulgar exhibition of it in any way, but to carry out the scheme of such a temple of science as he has so eloquently described. As to details, I think engineers and scientific men should all have an opportunity of discussing these. If I may be pardoned for criticizing the lecturer, I am sure he must feel that the project which he had prepared for the Paris Exhibition would have to be revised and re-revised, and every serious geographer and engineer, I am sure, would come to the same conclusion. Mr. Alfred Russel Wallace writes, vigorously maintaining his old project of a hollow globe as a superior one to that of M. Reclus. Again, from an engineer, I have a plan of how to rotate the globe and show all the phenomena of the seasons; the globe would seem to be floating in space. The interest shown in this matter shows that a project of this kind could be carried out, if properly planned and organized.

Mr. J. B. JORDAN: I did not expect to be called upon to make any remarks; but, as you have kindly mentioned my name, I will say a few words with regard to the scale. Elevations in relief would be so remarkably small if constructed on the proposed natural scale of 8 miles to an inch. Taking the British Isles for instance, our great mountain Snowdon, which rises about 3500 feet above the level of the sea, would be represented by only one-twelfth of an inch, and that would be exceedingly small. If Snowdon is represented by one-twelfth of an inch, how very slight the elevations would be to show the larger area of the British Isles! We have very large tracts of land that are below 500 feet in height, and it seems to me that on a model constructed on a natural scale of 8 miles to the inch, such

heights would scarcely be visible, and the greater part of the British Isles would practically be as smooth as a plain. I therefore think that a model globe on a natural scale would have but little value, as far as the British Isles are concerned. The vertical scale should be true throughout, but, for practical purposes, I think it should be somewhat exaggerated.

Mr. HENRY F. BRION (publisher of raised maps): I quite agree with the last speaker and the lecturer. During last year I made a large model of the river Thames, on a scale of 6 inches to the mile, and even with that scale, which was 6 inches to the mile instead of 8 miles to the inch, which is proposed for this globe, in order to show the elevations, it was necessary to increase the vertical scale four times. And, according to public opinion, the elevations then were not too large. Of course, the valley of the Thames and the hills surrounding it are small, I will grant. But still, if you make your large globe on the scale of 1 : 500,000, the vertical scale equal to the horizontal elevations of the height of even 500 feet would be no more than a few sand-grains sprinkled about the globe. I might say that on my model of the south-east part of England, which is on a scale of 4 inches to the mile, even the vertical scale of that has to be increased to show the elevations through the weald of Sussex. It is necessary in that case to raise the scale ten times to show heights of even 500 feet. I had a long interview with Sir Samuel Baker, and he entirely agreed with the lecturer that it is necessary to have large models of this earth, and to have delineated on it, not only the rivers and roads with lines and dots for towns, but also the elevations and depressions which are the main features of the earth, which are entirely lost on the ordinary maps. I may also mention the remark of the late Duke of Wellington. He gave the case of moving his army on the continent. He intended to be at a certain place in a given time, and he calculated the distance according to the map, and he found that he was several hours late in arriving on account of the elevation not being shown, and might have had his army annihilated in consequence. I myself, as descending from both the Army and the Navy, think that such a globe as is proposed is necessary, and I shall only be too pleased to lend my assistance, in any shape or form, to further the scheme for the construction of a national globe.

The PRESIDENT: The paper we have listened to with so much interest has suggested many things, and amongst others that we should revert to the use of globes and to curved projections to a far greater extent. It would be reverting to them, because in former days globes were very extensively used throughout Europe. I was reminded, by what was said in M. Reclus' paper, of a great mathematician and a great geographer, with whose writings I have had much to do—Robert Hughes, who flourished in the time of Queen Elizabeth and James I., and this is what he said of globes. He spoke almost in the same words that have been used by M. Reclus: "A globe is a figure cut proper and apt to the fashion of the earth as being most agreeable to nature, easiest to be understood, and also very beautiful to behold." It was through his influence, and the influence of other mathematicians who flourished in Europe in the sixteenth century, that globes came so much into use. You can seldom look at the lists of the instruments of the old discoverers, without seeing one, and generally two or three, globes in those lists. Mathematicians taught people how to puzzle out almost every problem in practical astronomy by the use of globes, and this was done almost universally before the use of logarithms became known. They afterwards fell into disuse, but now M. Reclus brings to our attention the importance, as regards accuracy especially, of using globes and curved surfaces for all our maps. I trust that he may succeed in his great idea of the construction of a globe large enough to show all the inequalities of the surface of the Earth. We should be very glad to help him in

this work. He has explained his project at this meeting with eloquence and with enthusiasm, combined with scientific sobriety, and I believe one way of helping him is that suggested by Prof. Geddes. I shall propose that a scientific committee be formed to assist and to co-operate with M. Reclus in his great attempt to improve the methods of constructing maps. I quite agree with him that it is a mistake, and is wrong, to distort maps by increasing the altitude of mountains. I remember many years ago a very large model of India was made, which was afterwards sent out to Calcutta, where the Himalayas were distorted to a ridiculous extent, and I think it merely tended to confuse those who used that model. I am sure you will now wish to pass a very hearty vote of thanks to M. Élisée Reclus for the most interesting paper which he has read to us.

THE MONTHLY RECORD.

EUROPE.

The Mennonite Colonies in South Russia.—The history and present state of the German Mennonite Colonies in South Russia is the subject of a paper by H. van der Smissen, in the eighth number of *Petermanns Mitteilungen* for the current year. The first settlers of this sect set out from the neighbourhood of Danzig in 1788, in response to the invitation of the Empress Catherine II., who offered many advantages to the colonists, including the free exercise of their religion and thirty years' immunity from taxation. They arrived at the spot chosen for the colony, near the junction of the little river Chortitza with the Dneiper, in July, 1789, and, in spite of many preliminary difficulties, a prosperous community became in time established, whilst by the introduction of the plough fruitful fields took the place of the steppes, which before had merely given pasture for cattle. Fresh colonists arrived from Germany, and in 1803–4 a new settlement was made on the Molochna, which, like the "old colony" at Chortitz, in time sent out offshoots into the surrounding districts. Flourishing settlements are to be found at the present day as far from the original colonies as Saratov on the Volga, and the neighbourhood of Stavropol in the Caucasus, and although a Russian form of government has now taken the place of the primitive organization, they remain German both in language and customs no less than in religion. A map, with descriptive letterpress by Paul Langhans, accompanies the paper, showing the situation and present statistics of the colonies, based on private information. In 1890 the number of German settlements amounted to 513, with a population of 310,342, and occupying together an area larger than that of Pomerania.

Re-opening to Navigation of the Elbing Mouth of the Vistula.—A note in *Globus* (vol. 74, No. 7) announces the re-opening as a navigable waterway, on July 1 last, of the Elbing branch of the Vistula, which debouches into the "Frische Haff." This channel was much used by vessels until 1840, when, owing to the breach made by the river near Neufähr, a great change ensued, the Elbing mouth becoming gradually silted up. Since 1895, owing to a new breach between Siedlersfähr and the Baltic, the conditions have become more favourable to the Elbing branch, and it has been possible, by the carrying out of the necessary works, to again throw it open to navigation.

Pine Forests succeeded by Oak Brushwood.—In a short note in *Globus* (vol. 74, No. 7), Dr. E. H. L. Krause shows that the conclusion sometimes drawn, from the existence at the present day of low oak woods on the Baltic coastlands,

that these were formerly covered with true oak forests, is not necessarily correct. He instances a case where the destruction of a *pine* forest has resulted in the growth of *oak* brushwood. In the neighbourhood of Thorn, where about ten years ago a portion of forest was cut down for the enlargement of the fortress, the forest trees consisted of pines, while a low growth of oak, kept down to the height of a man, or even less, by the forest officers, in many places covered the ground. Since the clearing of the ground the oaks have quickly sent up shoots, while the pine stumps have decayed, and new seedlings are destroyed by goats and cattle.

ASIA.

The Expedition to Christmas Island.—Mr. C. W. Andrews, who was last year sent out to Christmas island by Sir John Murray for the purpose of making a thorough scientific examination of its physical features, has returned to England with valuable collections representing the zoology, botany, and geology of the island. The dense forest with which it is covered, the scarcity of drinking-water, and the swarms of rats and land-crabs put many difficulties in his way, but these were successfully surmounted, though it was found impossible ever to progress at a greater rate than 2 miles a day. Much light may be expected to be thrown on the geological history of the island by Mr. Andrews' investigations. The succession of coral bands round the central volcanic core seems to show that its elevation must have taken place at considerable intervals.

Mr. R. T. Günther's Visit to Lake Urmia.—Mr. R. T. Günther has this summer proceeded to Lake Urmia, in Persia, for the purpose of investigating the fauna of the lake. This, like the fauna of Tanganyika, possesses a special interest from the fact that a species of *Medusa* has been supposed to exist in the lake, a point of much importance in connection with the past history of this body of water. Writing to *Nature* on July 20, Mr. Günther announced that the organisms referred to by Mr. Curzon as "jelly-fish," which are met with in swarms near the shore, are crustaceans belonging to the order *Branchiopoda*. They appear to him to resemble the *Artemia* group of varieties of the *Branchipus* type, which are specially adapted for life in waters much charged with salt. The natives, who know these organisms well, deny the existence of any other animal in the lake, and Mr. Günther had been unable to detect any other vestiges of life in the salt water, except the larva of a fly, found in very shallow water, and an alga which floats freely in the lake.

Lieut. Olufsen's Expedition to the Pamirs.—Writing to the Paris Geographical Society on June 14 last, Lieut. Olufsen announced his safe arrival at Osh, in Ferghana, with a caravan composed of ten armed men and sixteen horses. He proposed to spend the greater part of the summer in the neighbourhood of Yashil-Kul and Gaz-Kul, proceeding to Wakhan in the autumn, and taking up winter quarters in Shugnan, where a meteorological station will be established on the banks of the Panj. The expedition is provisioned for a year.

The Mentawei Islands, Sumatra.—A short account of the Mentawei islands—a group lying off the west coast of Sumatra—was given before the Berlin Geographical Society in April last by Herr Alfred Maass, and is printed in the fourth number of the *Verhandlungen* for the current year. The principal object of Herr Maass' visit was the collection of ethnographical objects, especially skulls of the natives, about whose affinities some doubt exists, and the greater part of the paper is taken up with the account of their manners and customs, etc. The group consists of four principal islands of volcanic origin, but with generally flat surface. Herr Maass landed on the most northerly but one, known, among other names, as South Pora, or Tobolagai, taking up his quarters, with his companion Dr. Morris, on Sioban bay. Sioban is one of the nine villages on the island, and after some

difficulties arising from the frequency of religious observances, during which the natives see no strangers, Herr Maass was able to pay a visit to it, and observe the people in their natural surroundings. The village consisted of three large and seventy small houses built on piles, and scattered without order in a forest clearing along the course of a stream. While some have held the natives to be of Polynesian, others of Malay stock, Herr Maass is inclined to think that they may be the remnant of an aboriginal population of Sumatra, but on this question some light may perhaps be thrown by the linguistic studies of Dr. Morris. They are of middle stature, are tattooed, and have long black hair with a shade of brown. They live chiefly by the chase and fishing, employing the bow and arrows for the killing of game; their attempts at cultivation are but slight. They are fetishists, the greatest object of veneration being a curved bamboo cylinder which is set up in the forest, adorned with flowers and leaves, and to which special attention is paid when a voyage is to be made. Communal ownership is not seen among them, private property being recognized, though much of the land is ownerless. The density of the primeval forest forbade the crossing of the island, and an attempted visit to the southern islands of the group was hindered by bad weather. Some botanical and zoological collections were made, special attention being paid to butterflies, of which sixteen new species were obtained out of a total of four hundred and fifty-one.

East Siberia.—Three important works have lately been published by the Russian Geographical Society in its Memoirs. All three are diaries which were kept during expeditions many years ago, but they have not lost their interest during the long years which have passed since these expeditions were made. Two of these volumes are diaries of the mining engineer, I. A. Lopatin, who travelled in the year 1865 in the northern parts of the Vitim plateau (vol. xxviii. No. 1), and next year along the Yenisei to Turukhansk (vol. xxviii. No. 2). For many reasons, one of which was the illness of the author, and the other was his desire to have all his geological collections well determined by specialists, these two diaries are only now published. Both were admirably kept, and are full of minute information as regards the topography and geology of the regions visited. During his Vitim journey, I. A. Lopatin remained all the time on the plateau, amidst the granites and gneisses and the old metamorphic slates, probably of Laurentian and possibly of Huronian age, in which no fossils have hitherto been found. The traveller made a very large collection of samples of the rocks which he met with, and this collection having been described by specialists, and the places where each sort of rocks was found being now marked on a map, the diary contains data which will be found very valuable to those who study these formations. I. A. Lopatin also describes the widely spread beds of basalts which cover that part of the plateau, and gives a great number of minute observations concerning their structure and the craters which are seen amidst them. He also saw here and there patches of conglomerates and limestones of undetermined age, as also patches of sandy superficial deposits, probably of Tertiary age. The diary of the Turukhansk expedition is much more interesting. The Palæozoic formations of the lower Yenisei seem to be disposed in a series of low ridges running from the south-east to the north-west, and are pierced by the river, which takes on these stretches a north-eastern direction. Silurian deposits occupy wide spaces on the lower Yenisei, and the fossils collected by Lopatin have been fully described by Friedrich Schmidt in his 'Mammoth Expedition.' Many boulders containing fossils of the Jurassic age are found along the banks of the Yenisei, but the rocks themselves were seen only at two spots. Traces of glaciation have only been observed by Lopatin in the shape of polished and scratched boulders, and a few scratched *roches moutonnées*, which the author was, however, inclined to ascribe to

the action of the Yenisei ice. The Post-Pliocene marine deposits attain in the north a thickness of 140 feet, which decreases southwards. A considerable number of marine subarctic fossils (described by F. Schmidt in the above-mentioned work) were found in these deposits, which appear on the banks of the Yenisei, beginning in latitude 77° 30′. A geological map accompanies this very valuable diary. The third work is the diary of the expedition of A. L. Czekanovski on the lower Tunguska, Olenek, and Lena rivers, in the years 1873–1875. It contains an excellent portrait of that remarkable explorer of East Siberia, a map of part of his Olenek journey (his other maps and the astronomical determinations of his travelling companion, Fred. Müller, being already incorporated in the general staff maps of Siberia) and several drawings. In the introduction we find a biography of Czekanovski, who was exiled to Siberia after the Polish insurrection of 1863, and spent thirteen years there. Owing to the intervention of his friend and university comrade, Friedrich Schmidt, who visited him in 1866, Czekanovski was allowed to stay at Irkutsk and to make several journeys for the Siberian Geographical Society. In 1876 he was permitted to come to St. Petersburg, in order to work upon his rich palæontological collections, but he was soon ordered to return to Irkutsk, whereupon he put an end to his brilliant scientific career by taking a strong dose of ammonia. F. Schmidt has quite correctly appreciated the results of Czekanovski's expedition by saying that it was richer in geological results than any other expedition to Siberia. Its main results have at various times been referred to in all geographical serials. The rich collections of Jurassic and Tertiary plants which he collected, were described by Oswald Heer and Prof. Schmalhausen; the animal fossils from the Jurassic period were described by Prof. Lagusen; the Triassic by Mojsisowicz; and the Silurian by F. Schmidt. The plants collected by Czekanovski and Müller were fully worked out by Trautvetter, and his linguistic materials by Prof. Schifner. The Devonian fossils only from the lower Tunguska, and also the plants collected on the banks of that river and his petrological collections, have not yet been fully described. As to general descriptive accounts of Czekanovski's journeys, we had only what was contained in his preliminary reports. Consequently, the Russian Geographical Society has now published the full diary of that memorable expedition, prepared for print by Czerski and partly by F. Schmidt. It is needless to say that the diary is full of most valuable data relative to the nature of the regions visited.

AFRICA.

Surveys in the Algerian Sahara.—We have already alluded (*Journal*, vol. xi. p. 667) to recent surveys by French officers in the neighbourhood of Insalah, which tended to confirm M. Foureau's views as to the position of that place. Still another survey has this year been carried out by Captains Germain and Laperrine, along a route leading from Fort MacMahon to Ksar-el-Kebir, the most central of the group of "Ksur" of the Insalah district. A large-scale map embodying the results of this survey has been constructed by M. Vuillot, and is published in the *Bulletin de l'Afrique Française* for July last, accompanied by explanatory letterpress. The result of the new surveys is to show that M. Foureau was right in shifting the formerly accepted position of Insalah towards the east, but that the longitude which he deduced from his 1893 itinerary to Hassi-el-Mongar (also shown on M. Vuillot's map) was 17′ 40″ too far in that direction. The itinerary of Captains Germain and Laperrine completely alters the map of the region, which was based almost entirely on information collected by Commandant Deporter in 1890. Many of the features of the country have to be shifted considerably to the north, and certain of them as much as 25 miles to

the east. The general direction of the successive terraces of the "Baten" is also completely altered.

Dr. Schoeller on his Journey in East Africa.—Dr. Max Schoeller, regarding whose journey in British East Africa (1896–97) some information has already been given in our pages, gave a brief account of the scientific results of that journey at a meeting of the Berlin Geographical Society in May last (*Verdhandlungen*, Nos. 5, 6). Regarding the ethnology of the region traversed, which formed Dr. Schoeller's special study, he is of opinion that nothing is to be gained, at present at least, by extensive subdivision of the tribes into groups, owing to the manner in which the customs, languages, etc., of neighbouring tribes pass into one another. Thus the Wa-Kikuyu, though Bantu, wear ornaments proper to the Hamites. The Nilotic tribes must, however, be provisionally placed in a separate group from the Bantu and Hamites, although it may be possible eventually to subordinate them to one or other of the main groups. The Hamites he considers to form but one group, which may be subdivided according to their occupation into Masai, Wakuafi and Wanderobo. The lands occupied by the Masai can never, in his opinion, be suitable for colonization, both on account of the opposition of the people themselves and because they have chosen as their home just those districts that are unsuitable for agriculture. The geographical details refer chiefly to the Natron lake and the districts of Sotiko and Lumbua (reached by following up the Guaso Nyiro from the lake), which, lying off the caravan route, have hitherto been little known. The Natron lake was to a great extent dried up at the time of Dr. Schoeller's visit, and its dark blue water was broken up into isolated lagoons. Into these some brackish hot springs poured their water, at temperatures varying from 84° to 102° Fahr. Much of the ground was occupied with extensive deposits of soda, which glistened like snowfields between the western valley-wall and the massive volcano Gelei on the opposite side. Following up the course of the Guaso Nyiro, the character of the landscape changed rapidly, steppe giving place to park-like country, and this to mountainous or hilly districts. In Sotiko and Lumbua the vegetation was extremely luxuriant, and the soil everywhere fertile, supporting a large population. Dr. Schoeller gave some account of the zones of vegetation passed through during the journey from the coast, as well as of the methods of survey adopted, the results in this direction being due to his companion, Herr Kaiser. He concludes with an appreciative estimate of the work accomplished by the British in Uganda.

Journey in Uha and Urundi.—A journey through some of the less-known parts of Uha and Urundi, in German East Africa, undertaken in 1895 by the fathers of the Catholic Mission station in Ushirombo, is described from the notes of Père Capus in *Petermanns Mitteilungen* (Nos. 6 and 8, 1898, with map). Passing through the small independent district of Utambala, the travellers next reached the dominions of King Rwaza, of Lunzewe, after crossing the river Nikonga, which terminates in swamps in the south of Uha. Rwaza's country has suffered much from the raids of the Bangoni (Zulus), but these have now been persuaded by the German authorities to give up their former mode of life, and, strange to say, have settled down as peaceful cultivators on the borders of Lunzewe under their chief Mupangalala. A permanent Zulu colony is, however, unlikely to be established, as the tribe is not a united one, and the chief daily loses followers by desertion, and has begun to show signs of restlessness himself. His residence, resembling a colossal cupola, astonished the travellers from its size. A large part of Lunzewe is taken up with *poris*, or thin woods, which alternate with savannahs and abound in game. On the side of Uha—from which it is separated by the southward-flowing Muyobozi, or Lukoki, a stream whose deeply cut bed was with difficulty crossed—

the country consists largely of uninhabited swampy plains, formerly, like the whole of Lunzewe, part of the dominions of the King of Uha. The present king, Kihumbi, of the race of the Bahuma, lives on bad terms with his neighbours, but is unable to recover the influence possessed by his predecessors, who even held sway over Urundi. His residence lies to the west of the Muhuazi, which, with several tributaries, drains the country southwards, apparently to the Malagarazi. The people of Uha are very superstitious, and their priests exercise a pernicious influence by means of the religious ban. Approaching the borders of Urundi, the travellers found the country more mountainous, giving the idea that the surface had been broken up by some vast catastrophe. On the west side of the Mbuli range, whose slopes were almost bare owing to the grass-burnings, the soil was much less fertile than in Uha; small streams, which become torrents during the rains, flow down in deeply cut valleys. Having, after some difficulty, obtained the leave of Rumonge, king of Urundi, for the establishment of a mission station near his capital, Père Capus returned to Ushirombo, across the southern districts of Uha, which form an almost uninhabited wilderness.

Train Service on the Congo Railway.—The *Mouvement Géographique* for September 11 publishes the regulations with respect to traffic on the Congo railway, lately issued by the company. Passenger trains leave either terminus of the line on Mondays, Wednesdays, and Fridays, halting for the night at Tumba, and reaching their destination on the evening of the following day. First and second-class tickets are issued, but the latter merely give the right to travel by goods waggon. First-class passengers are allowed the free conveyance of 100 kilogrammes of luggage. The first-class fare over the whole length of the line is 500 francs, the return ticket (available eight days) being half as much again. Second-class tickets cost exactly one-tenth of these amounts. The fare per mile for first-class tickets is thus slightly over 1*s.* 7*d.*, as compared with about 6*d.* on the Uganda railway.

The Jigger at Zanzibar.—Under the title of "The Latest Crossing of Africa," Dr. Oscar Baumann announces, in a short communication to *Petermanns Mitteilungen* (1898, No. 7), that the "jigger," introduced, it is supposed, into West Africa from Brazil in 1872, has in a quarter of a century made its way right across the continent to Zanzibar. In 1885 Dr. Baumann found the pest at Stanley pool, but it had not then reached the upper Congo. In 1892, however, it had already arrived at the western shore of the Victoria Nyanza, having, it is said, been brought thither by Stanley's expedition; it had also reached Tanganyika by way of Manyema. In 1895 it had made its way to Mpwapwa, and two years later to the East Coast, whilst it has since appeared in Zanzibar island. In the interior its ravages have been tremendous; but on the coast they are less severe, as the proper treatment is there understood.

The First River-steamer in German East Africa.—The supplement to the *Deutsche Kolonialzeitung* for June 16 last gives a description, with illustration, of the river-steamer (the *Ulanga*) which has been sent out in sections and put together on the Rifiji river, on the waters of which it is intended to ply. It is the first steamer which has been placed on the rivers of German East Africa. It is a stern-wheeler, with main and upper decks, the whole covered over by a light wooden awning. In addition to the quarters for captain and crew, accommodation has been provided for three passengers. The length at the water-line is 108 feet and the greatest breadth 22 feet.

German South-West Africa.—At a meeting of the Baden section of the German Colonial Society, held at Freiburg on May 6, Major Leutwein gave an account of the present state of the colony, and described the various difficulties

which had been encountered by the Germans in establishing their influence over the natives. Although, nominally, the German authority extended over the Nama Hottentos in the south, and the Hereros in the centre, it is in reality exercised only over the district between Windhoek and the coast. The Ovambos still show a marked distrust of Europeans. The entire population is estimated at 300,000, with 3000 whites at Windhoek. The efforts of missionaries have introduced a somewhat higher civilization among the natives, many, even of the Hereros, being Christians, adopting European dress, and speaking Dutch. Major Leutwein gave some account of the operations against the Nama chief, Witboi, who is now a firm friend of the German Protectorate. The rinderpest has proved a great misfortune for the colony, though by Dr. Koch's method of inoculation, 70 per cent. of the cattle have been saved. Cattle-rearing is only profitable on a large scale, a capital of £500 to £1000 being needed at first. Irrigation works are much needed. A most important question is the supply of women colonists, in order to avoid the evils of intermarriage with the natives. Major Leutwein insists on the need of taking out women from Germany.

A Botanical Garden for Uganda.—Mr. Alexander Whyte, whose botanical labours in Nyasaland since the establishment of the British Protectorate are so well known, has been entrusted by Government with the task of proceeding to Uganda for the purpose of establishing a botanical and experimental garden there. Much may be hoped from his labours in the way of investigating and development of the agricultural resources of that country.

Exploration in the Bangweolo Region.—With reference to Mr. Weatherley's paper on "The Circumnavigation of Lake Bangweolo," Mr. Demetrius Boulger calls our attention to the important work done by Belgian explorers in the region in question, particularly by the Bia-Francqui expedition, by the members of which the bronze tablet to Livingstone's memory was erected at Kitambo. It may be observed, however, that the attention of the meeting was primarily addressed to Lake Bangweolo as a geographical unit, and that the Belgian expedition, which did not approach within 40 miles of the open water of the lake, necessarily threw no new light on its geography. Our map was not intended to show the routes of all travellers in the region, but merely of those whose journeys had been of importance in the history of the exploration of the lake.

AMERICA.

Chilian Corcovado Expedition.—The exploration of the Western Patagonian Cordillera continues with unabated activity. Early in April the expedition, which set out from Chili in January, under the leadership of Drs. Paul Krüger and Ernst Rethwich, for the exploration of the Corcovado river, returned to Santiago de Chile after accomplishing a most successful piece of work. Some details respecting it are given in *Globus* (vol. 73, No. 23) and in *Petermanns Mitteilungen* (1898, No. 7). During the previous season the Cordillera had been crossed in 42½° S. lat., and the continental water-parting towards the headstreams of the Chubut had been explored. This year the task chosen was the exploration of the Cordillera south of 43°, and of the completely unknown Corcovado river, which, with three others, empties itself into the sea a little south of that latitude. The exploration of the river was carried out in a rowing-boat. In its lower course it has the character of a clear forest stream, about 300 yards wide, with a considerable volume of water. Higher up it narrows to 100 yards and less. Progress was rendered slow and dangerous by the rapids and sandbanks and by the sudden rise of the river. Two narrow gorges were met with on its upper course, the bed of the stream being

narrowed to 20 or 30 yards, while the cliffs on either hand are nearly impassable, and clothed with dense vegetation. At the second gorge the expedition was stopped by a deluge of rain, which lasted three days and caused the flooded river to carry down great stones with thundering noise. On February 25 the valley broadened out, but was blocked by a great glacier, whence the river has its origin. It has, therefore, a comparatively short course, its basin being bounded eastward by a steep bare range running from north to south at about 30 miles from the coast. Near 43° it forms an unbroken snowy chain, which bars all progress eastwards. The Futaleufu, a considerable stream flowing in a longitudinal valley, which had been discovered the year before, has no connection with the Corcovado, the three principal tributaries of which were traced to glacier sources. An excellent map of the whole Andean region which has been the scene of recent explorations, is given in the *Annales de Géographie* for May 15, based on the map issued by the La Plata Museum in 1896.

Journey of Dr. Karl Sapper in Honduras.—Dr. Karl Sapper, well known for his geographical work in Central America, has lately communicated to the Berlin Geographical Society some details regarding a journey in Eastern Honduras, undertaken by him early in the present year. After a visit to the mining centres of Santa Lucia and San Juancito—the latter possessing the most prosperous mines in all Central America—he followed the direction of the mountain range by Jutigalpa and Catacamas to the district of the Paya Indians, and thence to Trujillo. The mountains in this region were generally low, not by any means equalling those of Western Honduras. Trujillo has recently lost much of its importance, owing to the transfer of a large part of its trade to Ceiba and Puerto Cortez. In its neighbourhood there are large villages of Caribs, who speak a language containing a large admixture of French, English, and Spanish words. Hence he crossed the coast-range by a low pass, and returned to Tegucigalpa by the valley of the Aguán and the pack-road *viâ* Cedros. Dr. Sapper found the means of communication worse, and the population much more scanty in Eastern than in Western Honduras. The greater part of the people is of mixed descent, with a large admixture of negro blood. Geologically Eastern Honduras is marked by the preponderance of the older eruptive and crystalline rocks over the more recent, which play so important a part in the west. Pine and oak woods predominate on the heights, dry forests, savannahs, etc., in the lowlands. Moist tropical and subtropical forests are found only on the Atlantic coast and a few mountain summits in the interior, except in the extreme east (Mosquitia) where primeval tropical forest is said to prevail everywhere.

The Resources of the West Indies.—One outcome of the Royal Commission of inquiry into the condition of the British West Indies has been the creation of a new Botanical Department under the Imperial Government, which has been placed under the charge of Dr. D. Morris, lately assistant-director of the Royal Gardens at Kew, as Commissioner of Agriculture. Dr. Morris has proceeded to the West Indies to take up his duties. A recent number of the Kew *Bulletin* contains the appendix on the Economic Resources of the West Indies, contributed by Dr. Morris to the Report of the Commission, and embodying the results of his personal investigations. It is really a detailed account of the commercial geography of the British West Indies and British Guiana, a separate chapter being devoted to each island or colony. The soil, climate, natural resources, and chief agricultural produce of each are carefully summarized, with references to means of internal communication and inter-island trade. The fact that sugar-cane has hitherto been practically the only agricultural product to which serious attention has been paid throughout the West Indies has brought about the present serious

economic crisis as a consequence of the competition of beet-sugar. Local efforts have not been wanting to introduce fresh staples, and the cacao of Trinidad, the cacao and spices of Grenada where the sugar industry is practically extinct, the limes of Dominica and Montserrat, and the varied fruits of Jamaica are all of importance. Botanical stations under the various colonial governments have done a good deal in the way of experimenting with and introducing new products from other tropical countries. Dr. Morris advocates the more systematic organization of the botanic gardens, the combination with them of training schools for practically instructing selected natives, and so improving the methods of cultivation and the increase of facilities for export by improving roads and subsidizing additional lines of steamers. The fertility of the islands is so great, and the population so dense, that no doubt of the success of the new department under Dr. Morris can be entertained, and with this natural wealth wisely utilized, the West Indies ought to recover much of their old prosperity.

Ascent of Illimani by Sir Martin Conway.—Telegraphing to the *Daily Chronicle* from La Paz, on September 14, Sir Martin Conway announced his successful ascent of Mount Illimani (22,500 feet) on the 9th of that month. The ascent from the highest point of cultivation occupied five days, during three of which the party had the assistance of Indians as baggage-carriers, but these deserted on the fourth day. The last part of the ascent was made by a long ice-wall and across a huge snow-plateau, leading finally up a snow-ridge to the summit. During the last hour great weakness, but no actual illness, was experienced. Sir Martin Conway was about to start for Illampu (Sorata), sometimes supposed to be the highest summit of the Andes. He proposes to return to the coast at Antofagasta, and proceed by sea to Valparaiso, crossing the continent thence to Buenos Ayres.

The United States.—The latest addition to Stanford's 'Compendium of Geography and Travel' is a compact volume on the United States,* by Mr. Henry Gannett, the well-known geographer to the United States Geological Survey. The first chapter, entitled "General View of the Continent," gives a clear summary of the natural features of the United States, which is followed by brief descriptions of the climate, fauna, flora, mineral resources, population, social conditions, great cities, Indians and their remains, extent and area of the United States, history, government, agriculture, manufactures, transportation and commerce, and, lastly, Alaska. The subjects are treated in the order given above, and in large measure statistically. The facts are accurately recorded, and in the descriptive passages quotations from original authorities, such as Powell on the Grand Cañon of the Colorado, and Gilbert on Niagara Falls, are effectively introduced. Many of the paragraphs deal with aspects of the United States which are rarely treated systematically, and the work is everywhere thoroughly up to date. The difficult question of the population is admirably handled, and Mr. Gannett succeeds in giving an account of the history and institutions of his country without a boastful word. The illustrations are from original photographs, selected with great care, and each one illustrates some geographical fact. Special reference must also be made to the maps, which are numerous, clear, and very suggestive, illustrating both the physical and the demographical geography of the United States.

AUSTRALASIA AND PACIFIC ISLANDS.

Sir Wm. Macgregor's Second Journey across New Guinea.—In a despatch dated January 26, 1898, Sir Wm. Macgregor describes his second journey

* Stanford's 'Compendium of Geography and Travel' (New Issue), North America, vol. ii.: 'The United States,' by Henry Gannett, Chief Geographer of the United States Geological Survey. Maps and illustrations. London: Edward Stanford. 1898.

across British New Guinea, made in the reverse direction to that of 1896. The journey, which occupied fifty-one days, was hurriedly organized for the relief of a prospecting party beleaguered by hostile natives near the west end of the Owen Stanley range, and, being made at an unfavourable time of year, involved many difficulties and discomforts, chiefly from rain and cold; but some valuable surveying work was accomplished. After relieving the beleaguered men, the Lieut.-Governor proceeded to the camp established by Mr. Giulianetti on Mount Wharton, as described in our last number. The country through which the Vetapu flows is exceedingly mountainous, and that river and its branches have cut for themselves narrow and deep glens between the great peaks. The mountain slopes are mainly grass-covered up to 4000 to 6000 feet, but their summits are forest-clad. Owing to the steepness of the sides of the glens, the natives gradually push upwards to obtain virgin forest soil for cultivation. From the top of the Wharton range, the course of the Vetapu could be traced north and north-east for a considerable distance. The northern boundary of its valley seemed to be the mountains which separate it from the Angabunga. Towards the north and north-west the country is full of forest-clad mountains, but none was seen higher than Mount Yule. A good view was also obtained later on from Mount Scratchley: the Yodda valley, which begins at the foot of that mountain, runs for some distance parallel to the central range, finally merging in the Musa valley, which is shut in at the far end by the great mountain of Goropu. Yule island could be seen in the south, and the coast of the German territory on the other side. Animal life on these great mountain-tops proved scarce, birds even being few. The journey was continued to the government station on the Mambare, and down that river to the north coast. The reports of the gold prospectors in this district were not encouraging. Sir Wm. Macgregor insists on the importance of opening a path across the main range at a point where its elevation is lower, the route followed being difficult and exhausting, especially to the coast carriers, who are unfit for the high altitudes.

Exploration by Catholic Missionaries in British New Guinea.—The Roman Catholic missionaries established on the south coast of British New Guinea, to whom was due some years ago the discovery of the St. Joseph river, which flows into the sea opposite Yule island, have lately carried out further explorations in the country lying behind their sphere of operations (*Comptes Rendus*, Paris Geographical Society, 1898, p. 206). MM. Jullien and De Rycke left Vanuamae in August, 1896, and, passing through extensive forests, explored the headwaters of the Aroa, a stream which debouches into the north of Redscar bay. It is formed by the junction of two main branches, the Kubuna and the Veida, the latter of which was ascended, until, on reaching the mountains forming part of the Owen Stanley range, an important group of villages was reached, inhabited by a much more intelligent and energetic race than that of the coast. They are agriculturists, and build their villages on the top of steep eminences, the houses being conical in shape. Mount Manaku, a little to the east, has a height of over 6000 feet. On a second journey, a year later, the Fathers ascended the Kabuna through a mountainous country, and, beyond a narrow ridge over 3000 feet high, came upon the upper course of the St. Joseph river, which flows round the south side of Mount Boboleva (Davidson of English maps). Passing several villages, the travellers discovered the confluence of the two upper branches of the St. Joseph, the one coming from the direction of Mount Albert Edward (Umi Lebule) in the east, the other from the north, in which direction is a high mountain (Umi Manaia) not hitherto shown on our maps. It seems to reach a height of over 14,000 feet, and to be the culminating-point of a long chain running north-west. To the south-east there is a slightly lower mountain group. Some high mountains near the source of the eastern branch of

the St. Joseph are said to give rise to the Mambare, which enters the sea close to the Anglo-German boundary on the north coast. The whole region is filled with rugged mountains, taking the form of narrow parallel chains. Above 6000 feet the vegetation consists of cedars, pines, tree-ferns, oaks, etc. Many species of birds of Paradise are met with.

POLAR REGIONS.

Mr. Wellman's Polar Expedition.—Mr. Wellman's ship, the *Fridtjof*, has returned from Franz Josef Land, bringing news of the expedition down to August 2. Writing to us on that date, the leader announced the landing of his party at Cape Tegetthoff, and his proposed start for the north a few days later. The voyage to Franz Josef Land had been a successful one. After ten days in the ice, Cape Grant was reached on July 27, Cape Flora on the 28th. Here the ship was turned back by ice, reaching Cape Tegetthoff on the 30th, after which the tour of Wilczek and Salm islands was made before the final landing was effected. A house, named "Harmsworth House," as the inner shell was taken from Cape Flora, had been erected at Cape Tegetthoff, but, in spite of the temptation to winter there, Mr. Wellman hoped to be able to adhere to his original plan, and push northwards to Crown Prince Rudolf Land, wintering there in an improvised hut of stones and snow. The house at Cape Tegetthoff would be of use to fall back upon in case of need.

The German Expedition to the Arctic Seas.—The *Helgoland*, Captain Rüdiger, with the German Arctic Expedition under Herr Theodor Lerner on board, returned in August to Hammerfest, without having discovered any traces of Andrée's expedition. Some geographical work has been accomplished in the neighbourhood of Kong Karls Land, which, according to published statements, was found to consist of three islands, viz. Swedish foreland, Jena island, and a third lying in the centre, which was named August Scherl, after the promoter of the expedition. This is at variance with the account of Mr. Arnold Pike, who, it will be remembered, maintained that there is but one island in addition to Swedish foreland, which last is not usually included under the name Kong Karls Land. In spite of much ice and unfavourable weather, a passage was forced by the *Helgoland* round the eastern coast of the islands, and a latitude of 81° 32′ reached, *viâ* the east coast of North-East Land, the pack-ice then preventing further advance. Successful dredging operations were carried out to the north and east in depths of over 600 fathoms. On August Scherl island the breeding-grounds of the ivory gull were met with.

The Swedish Andrée Search Expedition.—Quoting from the *Aftonbladet* of Stockholm, the *Mouvement Géographique* (August 21) announced the arrival of M. Stadling, leader of the Andrée Search Expedition, at the mouth of the Lena. The expedition had visited the New Siberian islands, as also the neighbourhood of the Anabara and Indigirka rivers, without finding a trace of the missing explorer. M. Stadling was about to proceed to the Taimyr peninsula *en route* for the Yenesei. The same paper also announced that the Norwegian navigator, M. Brækmœ, had undertaken a journey to the New Siberian islands in order to find out whether the provisions left by Baron von Toll remain intact, but from a recent telegram it would seem that he has returned without accomplishing his object.

Pendulum Observations in Spitsbergen.—Although unable to visit Franz Josef Land, as he had originally planned, Prof. J. H. Gore proceeded this summer to Spitsbergen in order to carry out pendulum observations for the determination of the force of gravity in that high latitude. He has now returned, having spent several days on Danes island, making there an elaborate series of observations of the character contemplated, with the instruments of the U.S. Coast and Geodetic

Survey. Results were also obtained at Tromsö and Leyden, which stations, together with that at Washington, will form part of a series, approximately equidistant, which Prof. Gore hopes to extend southwards to the equator, covering 80° of latitude. In spite of a careful search, not a trace was found of anything which might throw light on Andrée's fate. His balloon-house was a complete wreck.

Lieut. Peary's Expedition.—The steamer *Hope*, which took coal and other supplies northwards for Lieut. Peary's expedition, returned from Greenland at the end of August, having parted from the *Windward* at Port Foulke, at the entrance to Smith sound. Lieut. Peary writing to us from Etah, August 13, states that the season as far north as Cape Sabine is a late one; he was just starting for the attack on Kane Basin and the channel above. So far his plans had progressed favourably. He had on board ten picked Eskimo (five couples), about sixty dogs, and the carcasses of sixty walrus.

Polar Exploration by Means of Ice-Breakers.—At a recent meeting of the Russian Geographical Society Admiral Makaroff submitted a proposal of reaching the pole by means of powerful ice-breakers. Steamers specially built for breaking the ice were first resorted to in Russia, in 1864, by the engineer Britneff, for breaking the ice at Kronstadt. Lately, ice-breakers have been very much improved in the United States, where the happy idea of providing steamers of that sort with twin screws at the stern, and a third screw at the stem, has proved to considerably increase their breaking powers. More recently, powerful ice-breakers have been constructed in the States and in England (by Armstrong) for Russia, for transporting the trains of the Siberian railway across Lake Baikal, and for keeping the port of Vladivostok clear of ice. Experiments were made with such steamers, and altogether the theory of ice-breakers was worked out. It appears that on the American lakes, the ice-breaker, *Ste. Marie*, 3000 horse-power, armed with a screw at the stem, easily makes her way through ice, 2½ feet thick, and pierces, when necessary, ice-walls, 15 to 20 feet high; and Russian engineers have calculated that, in order to sail through quite sound ice, 12 feet thick, an ice-breaker of 52,000 horse-power would be required. Such a steamer would also be able to cut its way, though at a slower speed, through ice-walls, which, as it appears from Nansen's experience, very seldom attain a height of 25 feet in the polar basin. A steamer of 52,000 horse-power would certainly be a very great enterprise, although we have already in the Atlantic liners some steamers of 28,000 indicated horse-power. But as a polar expedition would only sail in summer, when the resistance of the ice is considerably diminished, and there is no snow on its surface, Admiral Makaroff shows that a much smaller ice-breaker would be sufficient. In summer, the ice in the polar basin is very much weakened by the channels originating from the accumulations of salt, and, moreover, one-third, at least, of the area to be sailed through must be, according to Nansen's testimony, free of ice. Taking all that into consideration in a quite scientific way, Admiral Makaroff comes to the conclusion that a steamer of 20,000 horse-power would be quite sufficient, and makes the following approximate calculation: From latitude 78°, where the ice-cover begins, to the pole, the distance is 720 miles. Assuming that one-fourth part of it is ice-free, the ice-breaker would cover this ice-free portion at a speed of 12 knots. One-fifth part of the total distance (*i.e.* 144 miles) may be covered with ice one year old, which would be 7½ feet thick in the winter, but would have lost by thawing about 3 feet, and would thus have in summer the thickness of 4½ feet, out of which thickness about 20 per cent. must be deducted on account of the crevices and the salt channels in the ice. Its real resistance would thus correspond to the resistance of sound winter-ice 3½ feet thick, which a 20,000 horse-power ice-breaker would pierce at a speed of

4 knots. Applying the same reasoning to two-year-old ice, and so on, Admiral Makaroff finds: another 120 miles of such ice, as equivalent to sound ice, 4½ feet thick, speed of progress 3 knots; 120 miles of ice, 5½ feet thick, speed 2 knots; 120 miles of ice, 7 feet thick, speed 1·3 knots; and 36 miles of ice-walls, pierced at a speed of three-quarters of a knot. The whole distance of 720 miles could thus be covered in a little over twelve days, at an average speed of 2·4 knots. Moreover, experiments recently made in Russia have proved that, instead of making one ice-breaker of 20,000 horse-power, it would be advantageous to have two ice-breaking steamers of 10,000 horse-power each, it having been ascertained that two ice-breakers, placed one behind the other, and the after one pushing the other by means of a special wooden frame attached to the stern of the latter, have the same ice-breaking force as one steamer of a double force. With two ice-breakers, 6000 tons and 10,000 horse-power each, Admiral Makaroff is sure that the north pole could easily be reached.

Icebergs in the Southern Ocean.—We have received a reprint from the *Journal* of the Royal Society of New South Wales, of a second paper by Mr. H. C. Russell, on the "Icebergs of the Southern Ocean." The first paper, published in 1895, dealt with all the information collected up to July of that year, and the reports here discussed continue the record to September, 1897. The frequency with which icebergs are reported on the Cape-Australia route is investigated in relation to prevailing winds, and the provisional conclusion is arrived at that "when there is a prevalence of north-west winds no ice is reported, and with southerly winds plenty of ice is reported." The weak point of the conclusion is that the icebergs are 3000 miles distant from Australasia, where the winds are observed, and it is possible there may be an accidental relation between the position of the bergs and the direction of winds. From an inquiry into the general movements of the atmosphere between the Cape and Australia, made some years ago, Mr. Russell thinks this is scarcely possible, but he remarks that, while further observations are being collected, "it would materially aid the proof if any vessels sighting icebergs on a fine day with strong northerly or southerly winds, would stop the engines and watch the berg carefully for three or four hours to see if it does move with the wind. As soon as the motion with the wind is definitely determined by actual observation of the bergs, it will be possible, by careful study of the winds in South Africa and Australia, to forecast the positions of icebergs between Africa and Australia with some degree of exactness."

Mr. Borchgrevinck's Expedition.—Mr. Borchgrevinck's Antarctic Expedition sailed on August 22 in the *Southern Cross*, and its safe arrival at St. Vincent has since been announced.

GENERAL.

Two Books on Anthropogeography.—Two books have recently been published in France bearing on two separate and important aspects of the relation of man to the Earth. Prof. Auerbach, of Nancy, known for his excellent treatise on Lorraine and other geographical works, has made a special study of the racial geography of Austria-Hungary,* in which he enters into the question of what really determines a race, a nation, and a state. The result of the discussion is to show that nationality is a complex growth, in which common descent, a common language, and a common religion have all been factors, but no one of them essential.

* 'Les Races et les Nationalités en Autriche-Hongrie.' Par Bertrand Auerbach. Avec cartes. Paris: Felix Alcan. 1898.

Various nationalities may subsist in one state, but difficulties inevitably arise when any one nationality attempts to bring the others under subordination. The different provinces of the empire are treated separately with regard to the races inhabiting them and the peculiarities of settlement or colonization of the dominant race. The conclusion come to by the author is that the tendency of the Hungarian crown towards the enforced incorporation of the minor nationalities, is less likely to lead to the establishment of permanent equilibrium than the Austrian policy of according to the minor nationalities a considerable share of local government with free use of their own languages. A confederation of racial units is pointed to as the most stable form for so heterogeneous a state as Austria-Hungary. The book is illustrated with a very clear ethnographical map in colours, and a number of sketch-maps and diagrams. The second book deals with a kindred but quite distinct subject. Instead of studying the varieties of race in a heterogeneous state, M. Demolins * gives his attention to the influence of environment in producing varieties in a homogeneous people. His present volume deals with the south and the centre of France, another is promised treating of the north. His thesis is that the principal factors which determine the difference between a Norman and a Provençal, for example, are place and occupation. Other factors come into operation, but they are of minor importance. Occupation of itself produces distinct social types, the pastoral, agricultural, industrial, etc., but the shepherds and farmers of one region differ, on account of the character of soil and climate, from those of another. These principles are illustrated by a number of striking facts, and the whole theory is set forth with captivating clearness. The zone of pastoral occupation is first considered, and three distinct types of social life are described—those of the pastures of the high mountains (Alps and Pyrenees), of the calcareous plateaux of the Causses, and of the volcanic rocks of Auvergne. Pastoral life tends to produce the patriarchal social type, the families embracing several generations with community of property, but the degree varies, and in Auvergne the wiles of cattle-dealing have given rise to a transition to the commercial mode of life. Next the zone of fruit trees is considered, divided into those where the chestnut, the olive, and the vine respectively prevail. Here the social life is less communal and more individual, while the easier conditions of making a living induce a lower moral tone. The zone of small agricultural holdings is that typically found in valleys, where the irrigated meadows bordering the stream, and the fertile alluvial soil of the lower slopes lead to the minute subdivision of the land and to corresponding social arrangements. The valleys of the regions of the Rhone, Garonne, and Loire are separately considered. The zone of large farms is next taken, and this is shown to correspond with the plateaux intermediate between the mountains and the valleys, and necessarily more extensive than either. The plateaux of the Rhone, the Garonne, and the Loire basins are considered in turn, and the special social types associated with them are distinguished. Finally, a special chapter is devoted to the granitic plateau of Brittany, but here the element of race also comes into play, and M. Demolins illustrates his arguments by many comparisons with the Irish and Highland Celts. The method of study here set forth promises to be of great value in geographical investigations, at least in the study of regions where the people have had time to bring themselves into harmony with their physical environment.

College of Commerce at the University of California.—A new departure, which should lead to useful results, has been taken by the Board of Regents of the

* 'Edmond Demolins, Les Français d'aujourd'hui. Les Types Sociaux du Midi et du Centre.' Paris: Firmin-Didot et Cie. [Not dated.]

University of California, in the establishment, in January last, of a "college of commerce" in connection with the university. A pamphlet has been issued, setting forth the proposed scope and character of the college, and the provisional arrangements for 1898–99. It is intended to afford an opportunity for the complete study of commerce from a scientific point of view, and for the higher education of business men and members of the civil service. The studies will therefore embrace a broad range of subjects, such as international and commercial law, political economy, technology of the materials of commerce, history of commerce, geography in all its branches, modern languages, history, mathematics, etc. A large number of special courses already supplied by the university will be available to students, who may thus prepare themselves for almost any line of commercial activity. A chair of geography has lately been established at the University of California, and this was in March last offered to our honorary corresponding member, Prof. George Davidson, who entered upon his duties in July.

Drinking-water in the Tropics.—The eighteenth number of the *Mouvement Géographique* for the current year contains an abridged report of a lecture by M. Bergé before the Société d'Études Coloniales on the use of drinking-water in hot countries. The means ordinarily employed for the purification of water, boiling and filtration, are, M. Bergé points out, inadequate for the entire destruction of microbes, while boiling has the disadvantage of lessening the supply of oxygen which renders the water digestive. The procedure recommended by M. Bergé is an entirely new one, and consists in the sterilization of water by means of peroxide (binoxide) of chlorine. Although extremely unstable, and even explosive in its undiluted form, a dilute solution prepared at a low temperature can be used without danger, and will keep a long time if placed in a cool place and protected from light. Its cost is exceedingly small, and one part of the dilute solution will completely sterilize over two hundred parts of water, giving it no unpleasant taste. The binoxide of chlorine, which is formed by the reaction of sulphuric acid on chlorate of potash, can be manufactured by any one by the help of a simple apparatus, of which a sketch is given. A current of air is driven by a pair of bellows through a mixture of the above-mentioned substances, and the gas evolved is passed off by a tube into a bottle containing the water to be sterilized or the liquid which is to serve as its vehicle. It is hoped that this new process may become of great service to health in hot countries.

Practical Geography in Schools.—In the May number of the *Journal of School Geography*, Prof. W. M. Davis gave a detailed account of the equipment of a geographical laboratory for use in a school where a special room can be set apart for the purpose. He deals in detail with the fittings for storing and exhibiting maps and pictures and displaying lantern views, and indicates the best maps to use as specimens for showing the various types of land-forms. One large and a number of small hand globes are prescribed, and a battery of blackboards, some having outline maps painted upon them for use in demonstrations. A special feature is made of the gradual collection of a series of representative models or reliefs, and a collection of the commoner rocks and minerals also occupies a place. Work-tables are to be placed in a good light for carrying on practical work with maps and the preparation of models, etc. Arrangements are made for simple observations of the altitude of the sun, for the study of meteorological phenomena and of the weather maps—the latter, by the way, being supplied to schools free of charge in the United States. The article, although primarily intended for teachers in the United States, will well repay study by teachers in this country.

The Adventures of Colonel Alexander Gardner.—Sir Richard Temple writes an introduction to the biography of the hero of one of the most remarkable

romances of real life.* Alexander Gardner, the son of an emigrant from Scotland, was born in Ontario in 1785, and, his mother being half Spanish, was educated partly in Mexico. Afterwards he spent some time in Ireland; in 1812 he visited Madrid, and in the following year journeyed to Astrakhan, where his brother was employed in the Russian service. He went by Cairo, and through Syria to Trebizond, and applied himself to the study of geology and chemistry, to qualify for a post as inspector of mines in Russia. Disgusted with his prospects, he went to Persia in 1818, and for twelve years he wandered as a soldier of fortune through all the lands of Central Asia, taking part in the wars between Afghan princes, often a fugitive, and sometimes a freebooter. He traversed the Pamirs and all the leading states, travelled through Kafiristan and the Bolor ranges. The reference to Bolor leads Major Pearse to discuss the existence and position of the place referred to by that name, concerning which there has been much controversy. The conclusion arrived at is that Bolor simply is the Persian word *bálá*, meaning upper or above, and is applied to any high country by the people living at a lower level. At length Gardner reached Peshawar, and passed into the service of Runjit Singh. He served various Sikh rulers as colonel of artillery, and at length retired on a pension to Srinagar, where "he dreamed his life away," dying in 1877, in his ninety-second year. The numerous notes and manuscripts kept throughout his career were left in a fragmentary condition, but Sir Henry Rawlinson, Sir Henry Yule, Mr. Ney Elias, and other masters of Eastern geography, had no doubt as to the substantial accuracy of the story of his travels. They were looked upon with suspicion by many people, until numerous details were substantiated by other travellers.

War and Geography.—In a recent number of the *Journal of Geography*, Prof. T. C. Chamberlin, of Chicago, points out that the war between the United States and Spain might be expected to produce a great revival of interest in geography and in geographical education throughout the former country. He concludes, "The actual contact with geographic and geologic phenomena into which the hundred thousand young men, more or less, will be brought as a result of the impending campaign will be to them, and through them to others, a geographic education of no little moment. It was observed at the close of the Civil War that those who returned from its campaigns possessed an appreciation of the elements of position and physical relationship quite beyond that realized by the preceding generation educated under the benign influences of peace. These incidental contributions to our favourite sciences and to those elements of education which are associated with them will be among the compensations to be set over against the calamity of war."

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

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* 'Soldier and Traveller. Memoirs of Alexander Gardner.' Edited by Major Hugh Pearse, with an introduction by Sir Richard Temple. Edinburgh and London: Wm. Blackwood & Sons. 1898.

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps. **Rainaud.**

Note sur la division des Alpes Franco-Italiennes. Par A. Rainaud. Lyon: Imp. Mougin-Rusand, 1898. Size 10 × 6½, pp. 14.

A reprint from the *Revue Alpine* for April, 1898, proposing to simplify the three divisions of the Franco-Italian Alps so as to view the Maritime Alps as terminating in the massif of Cuchastraye, the Cottian Alps in the massif of Tabor, and the Graian Alps in the massif of Mont Blanc.

Alps. *Die Natur* **47** (1898): 337–340. **Wagner.**

Die Alpenflora in ihren Beziehungen zum Klima. Von Paul Wagner.

Alps. *Ann. G.* **7** (1898): 308–328. **Zürcher.**

Le relief du sol dans la partie méridionale des Basses-Alpes. Par M. Ph. Zürcher. *With Map and Plates.*

Andorra. *Deutsche Rundschau G.* **20** (1898): 407–412. ———

Die Andorranische Frage. *With Map and Illustrat on.*

The question of the mutual rights of France and Spain over Andorra is here discussed.

Austria. *Fortnightly Rev.* **64** (1898): 56–71. **Hirst.**

A dissolving Empire. By Francis W. Hirst.

Austria—Bohemia. *Rev. G.* **42** (1898): 466–471. **Auerbach.**

La Question des Tchèques et des Allemands en Bohême d'après le livre récent de M. Bertrand Auerbach.

Austria—Carinthia. *Riv. G. Italiana* **5** (1898): 306–313. **Marinelli.**

La Carnia in generale. Di G. Marinelli.

On the position and extent of the territory to which the name *Carnia* has been applied.

Austria—Graz. **Hann.**

Ueber die Temperatur von Graz Stadt und Graz Land. Von J. Hann. (Aus den Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien. Mathem.-naturw. Classe; Bd. cvii. Abth. ii. a. Februar 1898.) Wien, 1898. Size 10 × 6½, pp. 16.

Austria-Hungary. **Auerbach.**

Les Races et les Nationalités en Autriche-Hongrie. Par Bertrand Auerbach. Paris: F. Alcan, 1898. Size 9 × 6, pp. 336. *Maps. Presented by the Publisher.*

A note on this volume will appear.

Austria—Isonzo. *Riv. G. Italiana* **5** (1898): 198–200. **Tellini.**

Sui mutamenti avvenuti nel corso dei fiumi Isonzo e Natisone e sull' antico nesso esistente tra i medesimi del Prof. A. Tellini.

On the changes in the course of the Isonzo river since Pliocene times.

Austria—Lakes. *Riv. G. Italiana* **5** (1898): 216–217. **Gavazzi.**

Area e profondità di alcuni laghi Carsici. Communicazione preliminare del Prof. Dott. Arturo Gavazzi.

A table of the altitude, area, and maximum depth of thirty-six lakes of the Karst region in Austria.

Balkan Peninsula. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 80–86. **Haardt.**
Begleitworte zu den Blättern der Generalkarte 1: 200,000, welche die Balkan-Halbinsel betreffen. Von Vincenz Haardt von Hartenthurn. *With Map.*

Balkan Peninsula. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 161–192. **Truck.**
Die russische Triangulierung auf der Balkanhalbinsel in den Jahren 1877–1879. Nach officiellen Quellen bearbeitet von Sigismund Truck. *With Map.*

Bohemian Forest. *Leopoldina* **33** (1897): 136–140. **Wagner.**
Ueber Schneeverhältnisse im bayrisch-böhmischen Grenzgebirge. Von Dr. Paul Wagner.
On the snow-conditions of the mountains on the frontier of Bavaria and Bohemia.

Denmark. **Boyle.**
Trade and Agriculture of Denmark for the year 1897. Foreign Office, Annual No. 2141, 1898. Size 10 × 6½, pp. 28. *Plan. Price* 3½*d.*

Europe. *Scottish G. Mag.* **14** (1898): 281–294, 346–357. **Geikie.**
The Tundras and Steppes of Prehistoric Europe. By Professor James Geikie, D.C.L., etc. *With Map.*

Europe—Inland Navigation. **Penck and Leibbrand.**
Ueber die einheitliche Pflege der Hydrographie der Verbandsländer. 2 Heft. Vorträge von Professor Dr. Penck und Präsident Leibbrand. (Deutsch-Oesterreichisch-Ungarischer Verband für Binnenschifffahrt, Verbands-Schriften. No. xix.) Berlin: Siemenroth & Troschel, 1897. Size 9½ × 6½, pp. 24. *Presented by the Authors.*
On the importance of the study of the hydrography of the inland waterways of Austria-Hungary and Germany.

Faroes. *Blackwood's Mag.* **164** (1898): 244–260. ——
The Faroes.
On the origin, character, and daily life of the people of Faroe.

France. *Mém. S. Spéléologie* **3** (13) (1898): 1–54. **Décombaz.**
Les Grottes de la Vallée de la Bourne et du Vercors. Par M. Décombaz. *With Plans and Illustrations.*

France. *C. Rd.* **126** (1898): 1890–1891. **Delebecque.**
Sur les lacs de la Roche de Rame (Hautes-Alpes), du Lauzet (Basses-Alpes), de la Roquebrussanne et de Tourves (Var). Note de M. André Delebecque.

France. **Demolins.**
Edmond Demolins. Les Français d'aujourd'hui, Les types sociaux du Midi et du Centre. Paris: Firmin-Didot et Cie. [1898]. Pp. xii. and 466. *Maps and Plans.*
A special notice of this book is given.

France. *Tour du Monde* **4** (1898): 301–312. **Martel.**
Dans les cavernes des Causses (dixième campagne souterraine, 1897). Par M. E. A. Martel. *With Illustrations.*

France—Anjou. *La G.* **11** (1898): 187–188, 196–197. **Chevigné.**
Géographie historique and descriptive de la Vallée d'Anjou. Par Aug. de Chevigné.

France—Brittany. **Rainaud.**
La "Bretagne" de Rütimeyer. Analyse critique. Par A. Rainaud. Rennes: Plihon et Hervé, 1898. Size 10 × 6½, pp. 28.

France—Saint-Émilion. *B.S.G. Com. Bordeaux* **21** (1898): 241–249. **Saint-Laurent.**
Note sur Saint-Émilion. Par A. de Saint-Laurent.
Concise notes on the town and commune of St. Emilion, with reference to its wine industry, and historical memoranda.

Germany. *Globus* **74** (1898): 21–24. **Kohlenberg.**
Das Schwimmende Land von Waakhausen. Von A. Kohlenberg.
On the boggy moorland near Waakhausen.

Germany. *Globus* **74** (1898): 13–15. **Krause.**
Der ehemalige Thorner See. Von Dr. med. Ernst H. L. Krause. *With Map.*

Germany. *Notizb. V. Erdk. Darmstadt* **18** (1897): 4–13. **Nell.**
Resultate der im Grossherzogthum Hessen für die Zwecke der Internationalen Erdmessung ausgeführten Präcisions-Nivellements. Von Dr. A. Nell.

Germany—Brandenburg. *Naturw. Wochenschrift* **13** (1898): 313–315. **Zache.**
Tektonische Thäler und Erosionsthäler in der Mark. Von Eduard Zache. *With Sketch-Map.*
A contribution to the study of the morphology of the North German plain.

Germany—Frankfort. **Oppenheimer.**
Trade of Frankfort and District for the year 1897. Foreign Office, Annual No. 2122, 1898. Size 10 × 6, pp. 58. *Price* 3*d.*

Germany—Harz Mountains. *Terrestrial Magnetism* **3** (1898): 77–82. **Putnam.**
Results of Professor Eschenhagen's Magnetic Investigations in the Harz Mountains. By G. R. Putnam.

Germany—Meteorology. ———
Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. herausgegeben durch dessen Direktor Wilhelm von Bezold. Ergebnisse der Gewitter-Beobachtungen in den Jahren 1895 und 1896. Berlin: A. Asher & Co., 1898. Size 13 × 10, pp. xxx. and 38.

Germany—Schleswig. *Deutsche Rundschau G.* **20** (1898): 412–417. **Andresen.**
Die schleswigschen Halligen und das Leben auf denselben. Von P. Andresen.

Germany—Schleswig-Holstein. **Gottsche.**
M.G. Ges. Hamburg **13** (1897): 1–57; **14** (1898): 1–74.
Die Endmoränen und das marine Diluvium Schleswig-Holstein's im Auftrage der Geographischen Gesellschaft in Hamburg untersucht von Dr. C. Gottsche. *With Map.*

Germany—Schleswig-Holstein. *Globus* (1898): 359–361. **Hansen.**
Neue Köge in Süderdithmarsch. Von Dr. R. Hansen-Oldesloe. *Map.*
On the coast reclamations on the North Sea.

Greece. *Ann. G.* **7** (1898): 363–375. **Bérard.**
Topologie et toponymie antiques. Mégare. Par M. V. Bérard. *With Map.*

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **15** (1898): 149–153. **Kuyper.**
De Dichtheid der Bevolking in Nederland. Door J. Kuyper. *With Map.*
On the density of population in Holland.

Iceland. **Thoroddsen.**
Th. Thoroddsen, Geschichte der Isländischen Geographie. Vorstellungen von Island und seiner Natur und Untersuchungen darüber in alter und neuer Zeit. Autorisierte Uebersetzung von August Gebhardt. Zweiter Band: Die Isländische Geographie vom Beginne des 17. bis zur Mitte des 18 Jahrhunderts. Leipzig: B. G. Teubner, 1898. Size 10 × 7, pp. xvi. and 384.
This will be specially noticed.

Italy. *L'Universo* **8** (1898): 129–131. **Lanzoni.**
Per la navigazione fluviale fra Venezia e il bacino del Po, di Primo Lanzoni.

Italy—Florence. **Chapman.**
Florence, its Administration and Institutions. Foreign Office, No. 463, Miscellaneous, 1898. Size 10 × 6, pp. 48. *Price* 2½*d.*

Italy—Sicily. **Pigott.**
Trade of Sicily for the year 1897. Foreign Office, Annual No. 2120, 1898. Size 10 × 6½, pp. 48. *Price* 2½*d.*

Italy—Sicily. *Atti R.A. Lincei, Rendiconti* **7** (1898): 3–14. **Riccò.**
Determinazioni della gravità relativa fatte nelle regioni Etne e nella Sicilia orientale. Nota del A. Riccò.

Italy—Siena. *Blackwood's Mag.* **164** (1898): 23–39. **Oliphant.**
Siena. By Mrs. Oliphant.

Italy—Venice. *J.R.I. Brit. Architects* **5** (1898): 389–394. **Boni.**
The Lagoons of Venice. By Giacomo Boni. *With Map and Illustrations.*
An appeal for the improvement of Venice by dredging the channels and promoting the tidal scour of sea-water through the lagoons.

Italy—Vesuvius. *Atti R.A. Lincei, Rendiconti* **7** (1898): 314–315. **Matteucci.**
La comparsa di fiamme nel cratere vesuviano. Nota del prof. R. V. Matteucci.

Mediterranean. *J. Manchester G.S.* **11**, 1895 (1898): 287–306. **Blake.**

Notes of a Journey in Southern Spain and Tangier in 1895. By J. C. Blake. *With Map and Illustrations.*

Mediterranean—Crete.

Turkey. No. 3 (1898). Further Correspondence respecting the Affairs of Crete. London: Eyre & Spottiswoode, 1898. Size 13½ × 8½, pp. xvi. and 226. *Price* 2*s.*

Montenegro. *B.S.G. Italiana* **11** (1898): 346–352. **Baldacci.**

Gli Albanesi nel Montenegro. Comunicazione del socio dott. A. Baldacci.

Montenegro. **Kennedy.**

Trade of Montenegro for the year 1897. Foreign Office, Annual No. 2114, 1898. Size 9½ × 6½, pp. 6. *Price* ½*d.*

Norway—Bergen.

Officiel Fører gjennem Landsudstillingen og den Internationale Fiskeriudstilling i Bergen 1898. Bergen: John Grieg, 1898. Size 7 × 5, pp. 68. *Plans.*

The official guide to the Bergen exhibition.

Norway—Trade. **Dundas.**

Report for the year 1897 on the Trade and Commerce of Norway. Foreign Office Reports, Annual No. 2119. London: Eyre & Spottiswoode, 1898. Size 10 × 6, pp. 58. *Price* 3*d.*

Russia—Kurland. **Toll.**

E. von Toll, Geologische Forschungen im Gebiete der Kurländischen Aa. (Separat-Abzug aus den Sitzungsberichten der Naturforscher-Gesellschaft bei der Universität Jurjew (Dorpat), Jhrg. 18.) Size 8½ × 5½, pp. 34. *Presented by the Author.*

Russia—Ural. *M.G. Ges. Hamburg* **14** (1898): 1–23. **Friederichsen.**

Der südliche und mittlere Ural. Von Max Friederichsen. *With Plates.*

A description of the Ural excursion following the Geological Congress in Russia in 1897.

Russia—Warsaw. **Murray.**

Trade of Warsaw and District for the Year 1897. Foreign Office, Annual No. 2135, 1898. Size 10 × 6½, pp. 42. *Price* 3*d.*

Servia. *Globus* **74** (1898): 53–57. **Smiljanić.**

Die Hirten und Hirtennomaden Süd- und Südostserbiens. Von M. Smiljanić. I.

Sweden. **Andersson.**

Några anmärkningar om den Centralsjömtska issjön. Af Gunnar Andersson. (Aftryck ur Geol. Fören. i Stockholm Förhandl. Bd. 19. Häft 6, 1897.) Size 8½ × 5½, pp. [6].

Sweden—Lake Hjälmar. *Ymer* **18** (1898): 155–164. **Nerman.**

Hjälmarens vattenförhållanden åren 1889–1897. Af Gustaf Nerman.

Tables of the average water-level in terms of a gauge, the rainfall in millimetres, the resulting volume of water added in cubic metres, and the outflow for each month for nine years.

Switzerland. *Vierteljahrsber. Naturforsch. Ges. Zürich* **43** (1898): 1–24. **Heim.**

Geologische Nachlese. Von Albert Heim. Nr. 8. Die Bodenbewegungen von Campo im Maggiathale, Kanton Tessin. *With Plate.*

Switzerland—Valais. *Rev. Scientifique* **10** (1898): 144–146. **Pitard.**

Les populations du Valais. Par M. Eugène Pitard.

Turkey—Albania. *M. k.k. G. Ges. Wien* **41** (1898): 351–379. **Hassert.**

Wanderungen in Nord-Albanien. Von Dr. Kurt Hassert. *With Map.*

Describes a journey through Albania in 1897.

United Kingdom.

Customs Tariffs of the United Kingdom, from 1800 to 1897. With some Notes upon the history of the more important branches of receipt from the year 1660. London: Eyre & Spottiswoode, 1897. Size 13½ × 8½, pp. 908 and xxxvi. *Price* 7*s.* 6*d.*

This bulky report may be looked upon as in large measure a history of the Protective system as applied in the United Kingdom.

United Kingdom. *B. Geolog. I. University Upsala* **3** (1897): 369–411. **Munthe.**

On the Interglacial Submergence of Great Britain. By Henr. Munthe. *With Map and Sections.*

The evidence of the fauna of the interglacial clays in Kintyre and Inverness as to the submergence of Great Britain is here discussed.

United Kingdom—England. *J. Manchester G.S.* **13**, 1897 (1898): 159–164. ——

Kinder Scout Footpaths. *With Map and Illustrations.*

Account of a right-of-way in Derbyshire, with a map and well-selected photographs illustrating the character of the district.

ASIA.

Arabia. **Bent.**

Exploration in the Yafei and Fadhli Countries. By Mrs. Theodore Bent. (From the *Geographical Journal* for July, 1898.) Size 10 × 6½, pp. 24. *Map and Illustrations.*

Arabia. *A travers le Monde, Tour du Monde* **4** (1898): 209–212. **Charnay.**

Une Excursion à l'Oasis de la Hadg ou El Hota près d'Aden. Par M. Désiré Charnay. *With Illustrations.*

Arabia—Yemen. *Tour du Monde* **4** (1898): 265–276, 277–288. **Charnay and Deflers.**

Excursions au Yémen. Par Désiré Charnay et A. Deflers. *With Map and Illustrations.*

Asia. *Rev. Française* **23** (1898): 65–78. **Hulot.**

Les explorations en Asie en 1897. Par M. Hulot. *With Map.*

Asiatic Crown Colonies. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 91–97. **Badenoch.**

The Crown Colonies in Asia in 1898. By G. R. Badenoch, LL.D.

Caspian Sea—Pilot. **Pushchin.**

Caspian Sea Pilot. Hydrographical description and guide for Navigation. Compiled by Captain N. Pushchin. Publication of Chief Hydrographic Department. [In Russian.] St. Petersburg, 1897. Size 9½ × 6½, pp. viii. and 346. *Charts.*

Central Asia. *Ymer* **18** (1898): 97–125. **Hedin.**

En färd genom Asien. Af Sven Hedin. *With Map.*

Central Asia—Historical. **Berlioux.**

Les premiers Voyages des Européens dans l'Asie Centrale et au Pays des Sères la Chine du Nord. Par le Professeur E. F. Berlioux. Extrait du *Bulletin* de la Société de Géographie de Lyon de Juillet, 1898. Lyon, 1898. Size 10 × 6½, pp. 82. *Map.*

Central Asia—Turkestan. *Iz. Imp. Russ. G.S.* **33**, 1897 (1898): 403–410. **Masalsky.**

The Santorine Industry in Turkestan. By K. V. I. Musalsky. [In Russian.]

Ceylon. *J. Ceylon Br. R. Asiatic S.* **15** (1898): 93–131. **Bell.**

Interim Report on the Operations of the Archæological Survey at Sigiriya, 1897. By H. C. P. Bell. *With Plans and Illustrations.*

Ceylon. *J. Ceylon Br. R. Asiatic S.* **15** (1898): 23–37. **Modder.**

Ancient Cities and Temples in the Kurunégala District: Dambadeniya. By F. H. Modder.

Ceylon. *J. Ceylon Br. R. Asiatic S.* **15** (1898): 39–79. **Modder.**

A Geological and Mineralogical Sketch of the North-Western Province, Ceylon. By F. H. Modder.

China. *Blackwood's Mag.* **164** (1898): 132–145. ——

Pioneers of Commerce.

On the recent British commercial missions to China.

China. ——

China. Imperial Maritime Customs. 1. Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1897. Part 1.—Report on the Trade of China, and Abstract of Statistics. Shanghai. London: P. S. King & Son, 1898. Size 11 × 9, pp. 34.

China. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 62–68. **Barton.**

The Yang-tsze Valley and British Commerce. By Alfred Barton, M.D.

China. **Bourne.**

Report on the Trade of Central and Southern China. Foreign Office, Miscellaneous, No. 458. London: Eyre & Spottiswoode, 1898. Size 10 × 6½, pp. 100. *Maps and Section.* *Price* 1*s.* 5½*d.*

Permission was given to Mr. Bourne in August, 1896, to take charge of a commercial mission promoted by the Blackburn Chamber of Commerce, and he now reports on the information which he has collected. The report deals with the trade and the conditions of commercial life generally in Shanghai, Chingkiang, Hankow, and Ichang, and in the provinces of Ssu-ch'uan, Yünnan, Kuei-chow, Kwang-si, and finally in Canton and Hongkong.

China. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 35–61. **Colquhoun.**

The Railway Connection of India and China. By Archibald R. Colquhoun.

China. *J.E. India Assoc.* **30** (1898): 12–38. **Colquhoun.**

The Railway Connection of India and China. By Archibald R. Colquhoun.

The paper deals mainly with the resources of Southern China and the existing means of communication.

China. *Rev. Française* **23** (1898): 111–113. **Leroy-Beaulieu.**

Le chemin de fer de Pékin.

China. **Mayers.**

Report on a Journey from Peking to Shanghai Overland. Foreign Office, Miscellaneous, No. 466. London: Eyre & Spottiswoode, 1898. Size 10 × 6, pp. 16. *Price* 1*d.*

A full account of the route from Peking to Shanghai *viâ* Honan, with notes on native routes.

China. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 152–173. **Parker.**

Burma's supposed "Tribute" to China. By E. H. Parker.

China—Hainan. *B.S.G. Com. Paris* **20** (1898): 361–370. **Madrolle.**

L'île d'Hai-Nan. Par M. Cl. Madrolle.

China—Shantung. **Richthofen**

Schantung und seine Eingangspforte Kiautschou. Von Ferdinand Freiherr von Richthofen. Berlin: D. Reimer (Ernst Vohsen), 1898. Size 10 × 7, pp. xxviii. and 324. *Maps and Plates* (*and Maps in separate cover*). *Presented by the Publisher.*

This timely publication of fuller extracts from Baron von Richthofen's letters and journals than were published in his great scientific work on China will be more fully noticed.

China—Tea Production. *Oester. Monats. Orient* **24** (1898): 65–72. ———

Chinas Theeproduction und Thee-Export. (Special bericht des k. und k. General-Consulates in Shanghai.)

China—Wei Hai Wei. *Fortnightly Rev.* **64** (1898); 36–43. **Yorke.**

Wei Hai Wei, our latest leasehold possession. Being recollections of Wei Hai Wei, with suggestions for a definite policy in the Far East. By R. S. Yorke.

Chinese Empire—Tibet. *J. Asiatic S. Bengal* **67** (Pt. i.) (1898): 126–129. **Das.**

A Note on the Identity of the great Tsang-po of Tibet with the Dihong. By Sarat Chandra Das.

A block of wood engraved with a Tibetan inscription picked up in the Brahmaputra in 1896, is brought forward as confirmation of the identity of that river with the Tsanpo.

Chinese Empire—Tibet. *Questions Dipl. et Colon.* **4** (1898): 291–295, 353–362. **Roux.**

La politique Chinoise au Thibet. Par Émile Roux.

An account of the part played by China in Tibet.

Eastern Asia. *J. Asiatique* **11** (1898): 210–238. **Courant.**

Stèle chinoise du royaume de Ko kou rye. Par M. Maurice Courant.

Eastern Asia. **Schlegel.**

Geographical Notes. I. The Nicobar and Andaman Islands. II. Lang-ga-siu or Lang-ga-su and Sih-lan Shan, Ceylan. By G. Schlegel. Reprinted from the *T'oung-Pao*, vol. ix. No. 3. Leyden: E. J. Brill, 1898. Size 10 × 6½, pp. 24.

French Indo-China. *C. Rd. S.G. Paris* (1898): 229–232. **Amelot.**

La navigabilité du Mékong aux basses eaux entre Kratié et Stung-treng. Par G. Amelot.

French Indo-China. *Rev. Scientifique* **9** (1898): 785–787. **d'Enjoy.**

L'autonomie communale en Annam. Par M. Paul d'Enjoy.

French Indo-China. **Lefèvre.**

Un Voyage au Laos. Par le Dr. E. Lefèvre. Paris: E. Plon, Nourrit et Cie., 1898. Size 7½ × 5, pp. 304. *Map and Illustrations.*

The author was a member of the Pavie mission in 1894–95, which determined the boundary in co-operation with a British Commission.

India. ———

Imperial Institute. Indian Section. Annual Report for the year 1897–98. London: Eyre & Spottiswoode, 1898. Size 13½ × 8½, pp. 98. *Map and Diagrams.*

These reports deal chiefly with the chemical analysis of some Indian products.

India. *M.G. Ges. Hamburg* **14** (1898): 1–268. **Hübbe-Schleiden.**

Indien und die Indier, kulturell, wirthschaftlich und politisch betrachtet. Von Hübbe-Schleiden, Dr. jur.

The author spent two years in India, and in this interesting treatise he endeavours to correct the mistaken views prevalent in Germany as to Indian affairs. He deals in much detail with Hindu and Mohammedan life and customs, and has chapters on Indian civilization, commercial development, the British political system, and the future of India.

India. *B.S. d'Études Colon.* **5** (1898): 85–110. **Leval.**

Les Indes Anglaises et leur influence sur la grandeur de l'Angleterre. Par M. Gaston de Leval.

India. **Moos.**

Magnetical and Meteorological Observations made at the Government Observatory, Bombay, 1896, under the direction of N. A. F. Moos, with an appendix. Bombay, 1897. Size 14 × 10, pp. [88]. *Diagrams.*

India. *P.I. Civil Engineers* **132** (1898): 130–272. **Strange.**

Reservoirs with high earthen dams in Western India. By W. L. Strange. *With Plate.*

India—Andaman Islands. *Indian Antiquary* **27** (1898): 26–27. **Temple.**

Some technical terms and names in Port Blair. By R. C. Temple.

Curious results of corruptions of European names due to native mispronunciation, and subsequent phonetic transcription.

India—Assam. ———

Report on the Administration of the Province of Assam for the year 1896–97. Shillong, 1898. Size 13½ × 8½, pp. xiv., 210, and ccxvi. *Map. Presented by the India Office.*

India—Assam. **Home.**

Progress Report of Forest Administration in the Province of Assam for the year 1896–97. (From July 1, 1896, to June 30, 1897.) By A. L. Home. Calcutta, 1897. Size 13½ × 8½, pp. 98 and 6. *Map.*

India—Assam. **Monahan.**

Annual Report of the Department of Land Records and Agriculture, Assam, for 1896–97. By F. J. Monahan. Calcutta, 1897. Size 13½ × 8½, pp. 50. *Map.*

India—Burma. **Macquoid.**

Report on various sites for a Sanitarium in Burma. By Lieut. C. E. Macquoid. Rangoon, 1897. Size 13½ × 8½, pp. [20]. *Maps. Presented by the Quarter-Master-General in India.*

India—Chittagong. *J. Asiatic S. Bengal* **67** (Pt. 1) (1898): 20–28. **Das.**

A Note on the Antiquity of Chittagong, compiled from the Tibetan works Pagsam Jon-Zan of Sumpa Khan-po and Kāhbab Dun-dan of Lama Tārā Nātha. By Sarat Chandra Das.

India—Industry. *J.S. Arts* **46** (1898): 679–685. **Wood.**

Effect of the Cotton Spinning Industry in China upon the kindred Industry in India. By Walter C. Wood.

India—Madras. ———

Report on the Administration of the Madras Presidency, during the year 1896-97. Madras, 1897. Size 13½ × 8½, pp. xvi., 40, 214, and ccx. *Maps and Diagrams.*

India—Mica Mining. *J.S. Arts* **46** (1898): 671-673. **Thompson.**

Mica Mining in the District of Nellore, India. By Robert W. Thompson.

The mining of mica has lately been greatly extended.

India—North-West Provinces and Oudh. ———

Report on the Administration of the North-West Provinces and Oudh. For the year ending March 31, 1897. Allahabad, 1898. Size 13 × 8½, pp. iv., xxxvi., 202, iv., and 184.

India—Railways. **Gracey.**

Administration Report on the Railways in India for 1896-97. By Colonel T. Gracey. London: Eyre & Spottiswoode, 1897. Size 13 × 8½, pp. xiv., 220, and lxx. *Map and Diagram. Price 3s. 4d.*

Japan—Mining. *Oester. Monats. Orient* **24** (1898): 37-44. ———

Die Montanindustrie Japans.

Korea. **Willis.**

Report on a Consular Journey to Ping-yang and Chenampo. London: Eyre & Spottiswoode. Foreign Office, Miscellaneous, No. 433, 1897. Size 9½ × 6, pp. 16. *Price* 1½*d.*

Malay Archipelago—Amboina. **Wichmann.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **15** (1898): 200-218.

Der Wawani auf Amboina und seine angeblichen Ausbrüche. Von Arthur Wichmann. II.

Malay Archipelago—Java. **Davids.**

Trade of Java for the year 1897. Foreign Office, Annual No. 2095, 1898. Size 10 × 6, pp. 18. *Price* 1½*d.*

Malay Archipelago—Java. *Naturw. Wochenschrift* **13** (1898): 297-304. **Fürst.**

Kaffee-, Zucker-, Tabak- und Thee-Cultur auf Java. Von Dr. E. Fürst.

Malay Archipelago—Sumatra. *Rev. G.* **42** (1898): 379-384, 456-462. **Harrasowski.**

Au pays des cannibales (voyage de M. le baron de Brenner). Par Mme. de Harrasowsky.

Malay Peninsula—Flora. *J. Asiatic S. Bengal* **66** (2) (1897): 1-345. **King.**

Materials for a Flora of the Malayan Peninsula. By George King, LL.D., etc.

Malay Peninsula—Perak. **Wray, Stephens, and Derry.**

Perak Museum Notes. Vol. ii. Part ii. On Rubber and Ramie Cultivation in Perak, and Chapter V. of Tin Mining in Perak, by L. Wray, jun. Together with papers on Ficus Elastica and Tapping of Para trees at Kuala Kangsar, by A. B. Stephens and R. Derry. And a Report on the Perak Museum. Taiping, 1898. Size 10 × 6½, pp. 77-138. *Diagrams.*

Philippine Islands. *Contemporary Rev.* **74** (1898): 20-33. **Foreman.**

Spain and the Philippine Islands. By John Foreman.

Philippine Islands. *Fortnightly Rev.* **64** (1898): 72-87. **Garnett.**

The Philippine Islands. By Lucy M. J. Garnett.

Philippine Islands. *National G. Mag.* **9** (1898): 257-284. **Hilder.**

The Philippine Islands. By F. F. Hilder. *With Map, Chart, and Illustrations.*

The *National Geographic Magazine* is taking excellent advantage of the interest in geography evoked by the Spanish-American war, and now follows up its admirable Cuban number with a number devoted exclusively to the Philippine Islands.

Philippine Islands. **Walker.**

Trade of Philippine Islands for the year 1897. Foreign Office, Annual No. 2133, 1898. Size 9½ × 6½, pp. 14. *Plan. Price* 5½*d.*

Philippine Islands. *National G. Mag.* **9** (1898): 284-301. **Worcester.**

Notes on some Primitive Philippine Tribes. By Dean C. Worcester. *With Illustrations.*

AFRICA.

Abyssinia. *Mouvement G.* **15** (1898): 290-291. **Darragon.**
Exploration de l'Abyssinie méridionale. Par L. Darragon.

Abyssinia. *Questions Dipl. et Colon.* **4** (1898): 222-229. **Genardière.**
Les Chemins de fer Français en Abyssinie. Par G. de la Genardière. *With Map.*
On the projected French railway from Jibuti to Harrar (now under construction) and thence westwards to Enlotto.

Abyssinia. *B.S.G. Italiana* **11** (1898): 352-358. **Roncagli.**
Viaggio del sig. Darragon dallo Scioa al paese dei Bòran e viceversa, nota del socio corrispondente G. Roncagli.
On a journey of a French traveller, M. Leon Darragon, from Addis Abeba to the Boras country in the summer of 1897.

Africa—Exploration. *G.Z.* **4** (1898): 336-349. **Schenck.**
Die Afrikaforschung seit dem Jahre 1884 und ihr gegenwärtiger Stand. Von Dr. Adolf Schenck.

Africa—Leo's Work. **Schefer.**
Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^e^ jusqu'à la fin du XVI^e^ siècle. [Vols. xiii. and xiv.] Description de l'Afrique tierce partie du Monde escrite par Jean Leon African. Premièrement en langue Arabesque, puis en Toscane et à présent mise en François. Nouvelle Édition annotée par Ch. Schefer. [Vols. i. and ii.] Paris: E. Leroux, 1896-97. Size 11 × 7½, pp. (vol. i.) liii. and 378; (vol. ii.) viii. and 490. *Maps.*
An annotated reprint of Temporal's French translation of Leo Africanus' great 'Description of Africa.'

African Anthropolgy. *Z. Ges. Erdk. Berlin* **33** (1898): 111-125. **Frobenius.**
Der Ursprung der afrikanischen Kulturen. Von L. Frobenius. *With Maps.*

Africa—Railways. *A travers le Monde, Tour du Monde* **4** (1898): 237-238. ———
Les Chemins de fer en Afrique. *With Map.*

Algeria—Sahara. *A travers le Monde, Tour du Monde* **4** (1898): 201-204. **Blanchet.**
Les Villes mortes du Sahara. Par M. P. Blanchet. *With Illustrations.*
On the ruins found in the desert beyond Biskra.

British West Africa. *Fortnightly Rev.* **64** (1898): 216-230. **Bourne.**
Sierra Leone Troubles. By H. R. Fox Bourne.

British West Africa—Ashanti. *Kew B.* (1898): 65-82. ———
Botany of Ashanti Expedition.

British West Africa—Niger. *Globus* **74** (1898): 6-9. **Seidel.**
Aus der Fetischstadt Issele am unteren Niger. Von H. Seidel. *With Illustration.*

Cape Colony. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 84-90. **Seton.**
The Position of Cape Colony in South African Affairs. By Malcolm Seton.

Cape Colony—Kimberley. *T.S. African Philosoph. S.* **9** (1898): 54-67. **Sutton.**
An Inquiry into the Origin of the Mud Rushes in the De Beer's Mine, Kimberley, 1894-1896. By J. R. Sutton, B.A.

Cape Verd Islands. *B.S.G. Italiana* **11** (1898): 358-368. **Fea.**
Dalle Isole del Capo Verde, lettera del socio corrispondente Leonardo Fea. *With Illustrations.*

Central Africa. ———
1897. Report of the Universities' Mission to Central Africa. London: Published at the Office of the Mission. Size 7½ × 5½, pp. 118. *Portraits.*

Central Africa. *Oester. Monats. Orient.* **24** (1898): 44-47. **Schöller.**
Die Expedition Dr. Schöller's nach Centralafrika.

Central Africa. *Export* **20** (1898): 331-332, 340-342. **Schöller.**
Die Expedition Dr. Schöller's nach Centralafrika.

Congo State. *Globus* **73** (1898): 366-372. **Glave.**
Glaves Reise von Nyangwe nach Matadi. Grausamkeiten im Kongostaat. *With Illustrations.*

Congo State. **Pickersgill.**

Report on the Congo Independent State. Foreign Office, No. 459, Miscellaneous, 1898. Size 10 × 6½, pp. 14. *Price* 1*d.*

Congo State. *Rev. Scientifique* **10** (1898): 33–39. **Thys.**

Le Chemin de fer de Matadi au Stanley-Pool et les travaux publics au Congo. Par M. A. Thys.

East Africa. *Verh. Ges. Erdk. Berlin* **25** (1898): 251–262. **Schoeller.**

Herr Dr. Max Schoeller: Einige wissenschaftliche Ergebnisse seiner Expedition nach Äquatorial-Ost-Afrika und Uganda 1896–1897.

Egypt. ——

All about Postal Matters in Egypt. Florence: The Landi Press, 1898. Size 8½ × 6, pp. 24.

This anonymous pamphlet gives lists of the post-offices of Egypt, and examples of Egyptian names for places and people.

Egypt. *Z. Ges. Erdk. Berlin* **33** (1898): 1–25. **Schweinfurth and Lewin.**

Beiträge zur Topographie und Geo-chemie des Aegyptischen Natron-Thals. Von G. Schweinfurth und L. Lewin. *With Map.*

Egypt—Thebes. *J.R.I. Brit. Architects* **5** (1898): 421–435. **Hippolyte-Boussac.**

Thèbes: Excursion à la Vallée-des-Reines. Par P. Hippolyte-Boussac. With Illustrations by the Author, and English translation.

Eritrea. *Globus* **72** (1897): 362–366. **Bruchhausen.**

Die alten und neuen Grenzen Erythräas. Von Carl v. Bruchhausen. *With Map.*

French Congo. *C. Rd. S.G. Paris* (1898): 241–244. **Herr.**

La rivière Ouom. Par Dr. Herr. *With Sketch-maps.*

Controverting M. Wauters's identification of the river Wom, discovered by Clozel in 1894, with the Ombela, a tributary of the Ubangi.

French Congo—Cape Lopez. *Ann. Hydrographiques* (1897): 54–58. **Blim.**

Détermination de la position géographique du phare du cap Lopez. Par M. E. Blim.

The position of Cape Lopez has been redetermined by M. Blim, who finds it to be 0° 37′ 43″ S. and 6° 18′ 0″ E. of Paris, in place of 0° 36′ 25″ S. and 6° 22′ 55″ E., as formerly given.

French Sudan. *B.S.G. Lyon* **15** (1898): 111–126. **Ducret.**

Notes sur l'exploitation commerciale de la région du Nioro du Soudan Français. Par M. P. Ducret.

French Sudan. *A travers le Monde, Tour du Monde* **4** (1898): 169–172, 185–188. **Noll.**

La France au Soudan, de 1863 à 1898. Par M. Ned Noll. *With Map and Illustrations.*

French Sudan. *C. Rd., S.G. Paris* (1898): 233–235. **Vuillot.**

Reconnaissances dans la région des lacs de Tombouctou. Par P. Vuillot.

French West Africa—Ivory Coast. *B.S.G. Lyon* **15** (1898): 82–110. **Westphal.**

La Côte d'Ivoire, son avenir Industriel et Commercial. Par M. Westphal.

German East Africa. *M. Deutsch. Schutzgeb.* **11** (1898): 172–173. **Sprigade.**

Begleitworte zu der Karte der Reisen des Bergassessors W. Bornhardt im Nordwesten des Nyassa-Sees. Von P. Sprigade. *With Map.*

German West Africa—Togo. *Globus* **73** (1898): 340–344, 355–359. **Seidel.**

System der Fetischverbote in Togo. Ein Beiträg zur Volkskunde der Evhe. Von H. Seidel.

NORTH AMERICA.

Alaska. *J. School G.* **2** (1898): 206–215. **Semple.**

Indians of South-eastern Alaska in relation to their Environment. By Ellen C. Semple.

British Columbia and Alaska. **Kettle.**

A Supplement to the Third Edition of Findlay's Sailing Directory for the North Pacific Ocean, Chapters V. to IX., being the coasts and islands of British Columbia.

and Alaska, from the Strait of Juan de Fuca to Behring Strait. By W. R. Kettle. London: R. H. Laurie, 1898. Size 10 × 6½, pp. iv. and 56. *Presented by the Publisher.*

Canada—British Columbia. *P.I. Civil Engineers* **132** (1898): 1–46. **Stanton.**
The Great Land-Slides on the Canadian Pacific Railway in British Columbia. By R. B. Stanton. *With Maps.*

Canada—Geological Survey. ——
Summary Report of the Geological Survey Department for the year 1897. Ottawa, 1898. Size 10 × 7, pp. 156. *Plan.*

Canada—Yukon District. *Scottish G. Mag.* **14** (1898): 337–346. **Ogilvie.**
The Yukon District. By Wm. Ogilvie. *With Map and Illustrations.*

Canada—Yukon District. *Rev. G.* **42** (1898): 278–283, 345–355, 434–438. **Tricoche.**
Les mines d'or du Klondyke. Par G. N. Tricoche. *With Maps.*

Mexico. **Lumholtz and Hrdlička.**
Marked Human Bones from a Prehistoric Tarasco Indian Burial Place in the State of Michoacan, Mexico. By Carl Lumholtz and Aleš Hrdlička. Authors' Edition, extracted from *Bulletin* of the American Museum of Natural History, vol. x., article v., pp. 61–79. New York, March 31, 1898. Size 10 × 6½. *Plates. Presented by Carl Lumholtz.*

Mexico—Vera Cruz. **Chapman.**
Trade of Vera Cruz for the year 1897. Foreign Office, Annual No. 2134, 1898. Size 10 × 6, pp. 26. *Price* 2*d.*

United States. *P. Boston S. Nat. Hist.* **28** (1898): 157–235. **Bangs.**
The Land Mammals of Peninsular Florida and the Coast Region of Georgia. By Outram Bangs. *With Illustrations and Map.*

United States. *National G. Mag.* **9** (1898): 308–317. **Gilbert.**
Origin of the Physical Features of the United States. By G. K. Gilbert. *With Maps.*

United States. *National G. Mag.* **9** (1898): 329–338. **Gannett.**
Geographic Work of the General Government. By Henry Gannett.

United States—Arizona. *M.G. Ges. Hamburg* **14** (1898): 1–28. **Fernow.**
Die Wälder und Wüsten von Arizona. Von B. E. Fernow, PH.D., etc.

United States—District of Columbia. *National G. Mag.* **9** (1898): 317–323. **McGee.**
Geographic Development of the District of Columbia. By W. J. McGee.
An interesting account of the origin and development of the Federal capital of the United States.

United States—Georgia. *J. Franklin I.* **146** (1898): 19–26. **Tatham.**
Gold Mining in Georgia. By Wm. Tatham.

United States—Massachusetts. **Perry.**
The Physical Geography of Worcester, Massachusetts. By Joseph H. Perry. With illustrations by J. Chauncey Lyford. Published by the Worcester Natural History Society, Worcester, Mass, 1898. Size 9½ × 6, pp. 40. *Presented by the Author.*
An excellent piece of regional geography, illustrated by a series of highly characteristic photographs.

United States—Osage Indians. *Globus* **73** (1898): 349–355. **Gatschet.**
Die Osageindianer. Von Albert S. Gatschet. *With Illustrations.*

United States—Pacific Coast. **Holden.**
Smithsonian Miscellaneous Collections. 1087. A Catalogue of Earthquakes on the Pacific Coast, 1769 to 1897. By Edward S. Holden, LL.D. Washington: Published by the Smithsonian Institution, 1898. Size 10 × 6, pp. 254. *Maps. Presented by the Smithsonian Institution.*
The introductory matter describes the methods of seismological observations carried on at the Lick Observatory. The catalogue gives particulars of all recorded shocks on the Pacific coast.

United States—Texas. **Nugent.**

Galveston Harbour Improvements. Foreign Office, No. 464, Miscellaneous, 1898. Size 10 × 6½, pp. 20. *Maps. Price* 6*d.*

The importance of the great harbour improvements which have been carried out at Galveston may be partly explained by the fact that that harbour is nearer the centre of the United States than any other.

United States—Washington. *J. School G.* **2** (1898): 201–205. **Darton.**

Geography of Washington, D.C. By N. H. Darton.

United States—Western. *P. A. Nat. Sci. Philadelphia* (1898): 12–49. **Meehan.**

The Plants of Lewis and Clark's Expedition across the Continent, 1804–1806. By Thomas Meehan.

CENTRAL AND SOUTH AMERICA.

Andes. *Globus* **73** (1898): 333–340. **Jansen.**

Morenos Expedition in die Patagonischen Anden 1896. Von Dr. Hubert Jansen. *With Map and Illustrations.*

Andes. *Z. Ges. Erdk. Berlin* **33** (1898): 25–36. **Polakowsky.**

Moreno's Forschungsreise in den Andes zwischen dem 37. und 47°. südl. Br. Von Dr. H. Polakowsky.

Argentine-Chile Frontier. **Bunster.**

The Chilo-Argentine Boundary Question. An answer to F. P. Hansen, Esq. By José Onofre Bunster. London: Printed by the South American Journal, Limited. 1898. Size 10 × 6, pp. 16.

Argentine Republic. *B.S.G. Com. Paris* **20** (1898): 305–316. **Wiener.**

Ma mission en Argentine. Par M. Ch. Wiener.

The author visited the Argentine Republic in order to ascertain the cause of the reduction of French imports in that country, and to discover a remedy.

Brazil. *Globus* **74** (1898): 47–49. **Katzer.**

Die Stromenge des Amazonas bei Obidos. Von Dr. Friedrich Katzer. *With Map.*

Brazil. *Rev. Museu Nac. Rio de Janeiro* **1** (1896): 185–223. **Ule.**

Relatorio de uma excursão botanica feita na Serra do Italiaia. Por Ernesto Ule.

Brazil. *Export* **20** (1898): 353–355. **Scheler.**

Ein Ausflug nach Paraná, Südbrasilien. (Originalbericht von Ingenieur C. F. Scheler.)

Brazil—Bahia. **Praguer.**

Rev. Trim. I.G. e Hist. Bahia **4** (1897): 419–431; **5** (1898): 81–106.

Riqueza mineral do Estado da Bahia. Por Henrique Praguer.

Brazil—Matto Grosso. *Rev. Museu Nac. Rio de Janeiro* **1** (1896): 59–88. **Derby.**

Nota sobre a geologia e paleontologia de Matto-Grosso. Por Orville A. Derby.

The papers in this publication are printed in duplicate in Portuguese and in English.

Brazil—Pará. **Churchill.**

Trade of Pará and District for the year 1897. Foreign Office, Annual No. 2140, 1898. Size 10 × 6, pp. 36. *Map. Price* 3½*d.*

Brazil—Prado. *Rev. Trim. I.G. e Hist. Bahia* **5** (1898): 3–25. **Frot.**

Explorações no Municipio do Prado pelo Engenheiro Apolinario Frot.

British Guiana. *La G.* **11** (1898): 193–195, 205–208. **Fontaine.**

La Guyane britannique (Colonie de Demerara). Par M. O. Fontaine.

Chile. *B. Geolog. I. University Upsala* **3** (1897): 313–351. **Nordenskjöld.**

Ueber einige Erzlagerstätten der Atacamawüste. Von Otto Nordenskjöld.

Colombia. *Globus* **73** (1898): 381–389. **Sievers.**

Des Grafen Josef de Brettes Reisen im nördlichen Colombia. Von W. Sievers. *With Illustrations.*

A critical summary of a journey published in the *Tour des Monde.*

Cuba. *J. Franklin I.* **146** (1898): 26–45. **Cabrera.**

Mineral Resources of Cuba. By Raimundo Cabrera. Translated from the Spanish by Louis Edward Levy.

Cuba. *Nineteenth Century* **44** (1898): 196–207. **Pérez.**
The Spaniards in Cuba. By Antonio Gonzalo Pérez.

Cuba. *Rev. Française* **23** (1898): 417–429. **Vasco.**
L'Insurrection Cubaine. Par G. Vasco. *With Map.*

Cuba—Santiago. *Rev. Française* **23** (1898): 359–363. **Lassalle.**
Santiago de Cuba. Par C. de Lassalle. *With Map.*
The map is a very rough sketch.

Cuba. *Contemporary Rev.* **74** (1898): 1–19. **Musgrave.**
The Cuban Insurrection. By G. C. Musgrave.

Cuba. *Quarterly Rev.* **188** (1898): 216–241. ———
The United States and Spain.
A summary of the events leading to the war between Spain and the United States.

French Guiana. *Rev. Scientifique* **10** (1898): 7–15. **Levat.**
Les placers auriferes du Contesté franco-brésilien. Par M. E. D. Levat.
The article gives a history of the dispute as to the boundary between French Guiana and Brazil, points out that the region in dispute is richly auriferous, and urges that a railway should be constructed to supply ready access.

Guatemala. **Trayner.**
Trade of Guatemala for the year 1897. Foreign Office, Annual No. 2139, 1898. Size 10 × 6½, pp. 48. *Price* 2½*d.*

Jamaica. **Roxburgh and Ford.**
The Handbook of Jamaica for 1898 . . . comprising Historical, Statistical, and General Information concerning the Island. Eighteenth Year of Publication. Compiled . . . by T. L. Roxburgh and Jos. C. Ford. London: E. Stanford, 1898. Size 9 × 6, pp. viii., 560, and x. *Map. Presented by the Publisher.*

Jamaica. *T. Canadian I.* **5** (1898): 325–357. **Spencer.**
Late formations and great Changes of Level in Jamaica. By J. W. Spencer. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasie. *Deutsche Rundschau G.* **20** (1898): 450–457. **Greffrath.**
Fortschritte der geographischen Forschungen und Reisen im Jahre, 1897. I. Australien und die Südsee. Von Henry Greffrath.

Australia. **McCormick.**
Trip to the Land of the Kangaroo. By Rev. W. T. McCormick. Size 6 × 8. *Presented by the Author.*
A personal record of an ordinary trip to Australia.

Australia. **Fetherick.**
Australia in 1897. The Country and its Resources, Population, Public Works, and Finances. With Remarks on the Manufacture of Wool in the Colonies, Emigration, Federation, the Funding of Australian Public Debts, etc. Second Edition. By Edward A. Fetherick. London: Effingham Wilson, 1897. Size 9½ × 6, pp. 56. *Maps. Presented by the Author.*

Australia—Year-Book. ———
The Year-Book of Australia for 1898. Seventeenth Year of Publication. London: Paul & Co. Size 9 × 6, pp. 760. *Maps. Price* 10*s.* 6*d. Presented by the Agent-General for New South Wales.*

British New Guinea. ———
Annual Report on British New Guinea from 1st July, 1896, to 30th June, 1897. With Appendices. Brisbane, 1898. Size 13½ × 8½, pp. xxvi. and 96. *Maps and Illustrations. Presented by the Colonial Office.*

British New Guinea. *B.S.G. Italiana* **11** (1898): 385–399. **Giulianetti.**
Nella Nuova Guinea Britannica. Lettera di Amedeo Giulianetti al presidente della Società, march. G. Doria. *With Map and Illustrations.*
The author, on this journey, explored part of the Wharton range.

British New Guinea. ———
British New Guinea. Correspondence relating to an Agreement between the Government of British New Guinea and the British New Guinea Syndicate. London: Eyre and Spottiswoode, 1898. Size 13½ × 8½, pp. viii. and 34. *Price* 4½*d.*

Fiji. **Vaughan.**
Fiji. Meteorological Observations taken at Suva during 1897. By J. D. W. Vaughan. Suva: E. J. March, 1898. Size 13½ × 8½, pp. 16.

Kerguelen. *Questions Dipl. et Colon.* **4** (1898): 205–213. **Thirion.**
Kerguelen Station navale et lieu de déportation. Par Paul Thirion. *With Map.*
Notes on Kerguelen in connection with a proposal recently made to establish a French penal settlement in that island.

POLAR REGIONS.

Antarctic Drift Ice. *Ann. Hydrographie* **26** (1898): 219–226. ——
Treibeis in höheren südlichen Breiten.

Arctic. *J. City of London College Sci. S.* **5** (1898): 29–50. **Kœttlitz.**
Three Years in the Arctic. By J. Reginald Kœttlitz.
A concise account of the Jackson-Harmsworth expedition.

Arctic Ocean. *Iz. Imp. Russ. G.S.* **33**, 1897 (1898): 369–402. **Wrangell and Makaroff.**
Researches in the Northern Arctic Ocean. Reports of Baron F. F. Wrangell, and Vice-Admiral S. O. Makaroff. *With Map and Diagrams.* [In Russian.]

Arctic—Sannikoff Island. *Globus* **73** (1898): 365–366. **Pech.**
Sannikow-Land im Sibirischen Eismeere und der Plan einer Expedition dahin. Von T. Pech.
The plan of Baron Toll's expedition was given in detail in the *Journal* for August.

Græenland. *Ymer* **18** (1898): 141–154. **Flink.**
En mineralogisk resa i Grönland 1897. Af Gust. Flink. *With Map.*
Mineralogical observations in the Julianehaab district.

Spitsbergen. *Ymer* **18** (1898): 127–140. **Meisenbach.**
En färd till Sjuöarne Sommaren 1897. Af G. Meisenbach. *With Map and Illustrations.*
A visit to the Seven Isles in the north of Spitsbergen in the summer of 1897.

MATHEMATICAL GEOGRAPHY.

Azimuth Tables. *Ann. Hydrographie* **26** (1898): 211–218. **Meldau.**
Ueber Azimuttafeln. Von Dr. Heinrich Meldau.

Barometric Heights. **Cordeiro.**
The Barometrical Determination of Heights. A Practical Method of Barometrical Levelling and Hypsometry for Surveyors and Mountain Climbers. By F. J. B. Cordeiro. London: E. & F. N. Spon, 1898. Size 7 × 5, pp. 28. *Presented by the Publishers.*

Cartography. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 203–226. **Hödlmoser.**
Ueber Terrain-Darstellung in Karten. Von Carl Hödlmoser. *With Maps.*

Cartography. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 193–202. **Hübl.**
Beiträge zur Technik der Kartenerzeugung. Von Arthur Freiherrn von Hübl. II. Der Kartendruck. *With Maps.*

Cartography. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 53–66. **Steeb.**
Die geographischen Namen in den Militär-Karten. Von Christian Ritter von Steeb. *With Maps.*

Geodesy—Gravity. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 100–160. **Sterneck.**
Relative Schwerebestimmungen, ausgeführt in den Jahren 1895 und 1893. Von Robert von Sterneck. *With Maps.*

Godesy. **Weiss and Schram.**
Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des k. k. Gradmessungs-Bureau, ausgeführt unter der Leitung des Hofrathes Theodor V. Oppolzer, Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. IX. Band. Längenbestimmungen. Wien: F. Tempsky, 1897. Size 12½ × 10, pp. 228.
The determination of the difference in longitude between Greenwich, Munich, and Vienna.

Geographical Instruments. *Scottish G. Mag.* **14** (1898): 357–363. ——

From Astrolabe to Quadrant.

A sketch of the evolution of the quadrant through the cross-staff.

Height-Measurement. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 87–99. **Rummer.**

Die Höhenmessungen bei der Militär-Mappierung. Von Adolf Rummer von Rummershof. *With Map.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coast Features. *J. School G.* **2** (1898): 215–227. **Curtis.**

A Model of Seashore Characteristics. By G. C. Curtis. *With Illustrations.*

Desert Scenery. *Naturw. Wochenschrift* **13** (1898): 237–241. **Walther.**

Ueber die Formen der asiatischen Wüste. Von Johannes Walther.

An abstract of part of Prof. Walther's work on the phenomena of desert erosion.

Forests. *J. Franklin I.* **146** (1898): 1–19. **Gifford.**

Forestry in Relation to Physical Geography and Engineering. By John Gifford. *With Illustrations.*

Geomorphology. *Mem. S.G. Italiana* **7** (1898): 267–304; **8** (1898): 3–51. **Porena.**

Della Morfologia della superficie terrestre nella geografia e dei tipi di rilievo colla loro nomenclatura in italiano. Memoria del prof. F. Porena.

A critical study of the classification and terminology of land-forms, with constant reference to the work of Richthofen, Penck, De Lapparent, and Wagner.

Geophysics. *J. City of London College Sci. S.* **5** (1898): 1–17. **Lobley.**

Presidential Address: The Crust of the Globe and its Disturbances. By Prof. J. Logan Lobley. *With Illustration and Diagram.*

Also separate copy. *Presented by the Author.*

A study of the crust of the Earth, the author believing that all surface movements are the results of physical and chemical changes in the superficial layer of crust, all below 10 miles in depth being altogether apart, not affecting the crust, and unaffected by it.

Land Forms. *T. Canadian I.* **5** (1898): 359–368. **Spencer.**

Resemblances between the Declivities of High Plateau and those of Submarine Antillean Valleys. By J. W. Spencer. *With Map.*

Meteorology. *Ann. Hydrographie* **26** (1898): 203–209. ——

Reisen der Schiffe "Nereus." Kapt. J. Schulte, und "Pestalozzi," Kapt. B. Petersen, von Lizard nach Valparaiso. *With Charts.*

The nearly simultaneous voyages of these vessels have enabled a series of synoptic isobaric charts to be drawn.

Meteorology— **Woeikof.**

Einige Resultate der fünfjährigen Beobachtungen auf dem Eiffelthurme. Von A. Woeikof. From *Meteorologische Zeitschrift*, Oktober 1897. Size 11½ × 8, pp. 353–359.

Meteorology—Clouds. ——

No. 112. [U.S.] Hydrographic Office. Illustrative Cloud Forms for the Guidance of Observers in the Classification of Clouds. [Washington, D.C., 1897.] Size 5½ × 10. *Presented by the U.S. Hydrographic Office.*

A series of very beautiful cloud pictures reproduced in colour. The only adverse criticism that might suggest itself, is that the artistic treatment of the foregrounds sometimes detracts from the effect of the cloud forms. If all the foregrounds had been the same, it would have been better from the meteorological point of view.

Meteorology—Clouds. *Meteorolog. Z.* **15** (1898): 216–225. **Erk.**

Ueber die Einwirkung von Flussläufen auf eine darüber befindliche Wolkendecke. Von Dr. F. Erk.

The author notes the curious phenomena observed by him on balloon ascents, that a layer of cloud lying over an irregular country presents on its upper surface depressions corresponding to the course of the valleys it conceals.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology—Homanen. **Schwerdtfeger.**

Die Heimath der Homanen (Indogermanen). IV. Von Schwerdtfeger. Cruttinnen, 1898. Size 9 × 6, pp. 36. *Presented by the Author.*

Commercial Geography—Coal. *Nineteenth Century* **44** (1898): 151–168. **Taylor.**

The Coal Supplies of the World. By Benjamin Taylor.

Commercial Geography—Cotton. *Ann. G.* **7** (1898): 289–307. **Lederlin and Gallois.**

La culture du coton dans le monde. Par MM. A. Lederlin et L. Gallois. *With Map and Diagram.*

Commercial Geography—Gold. **Suess.**

Mem. and P. Manchester Lit. and Philosoph. S. **42**, No. 10 (1898): 1–9.

The New Gold Discoveries. By Eduard Suess.

Prof. Suess recalls and confirms the dictum of the Greek philosophers that gold is only found on the utmost frontiers of civilization. With the increasing output of gold, and the diminishing area beyond the frontiers of civilization, Prof. Suess sees an early prospect of exhaustion of supply; and a very serious danger in the extension of gold standards for currency in countries now using silver.

Historical. **Fresne-Canaye.**

Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^e^ jusqu'à la fin du XVI^e^ siècle. XVI. Le Voyage du Levant de Philippe du Fresne-Canaye (1573). Publié et annoté par M. H. Hauser. Paris: E. Leroux, 1897. Size 11½ × 7½, pp. xxxviii. and 332. *Portraits, Map, and Plates.*

Historical—Etna. **Sudhaus.**

Sammlung wissenschaftlicher Commentare zu Griechischen und Römischen Schriftstellern. Aetna. Erklärt von Siegfried Sudhaus. Leipzig: B. G. Teubner, 1898. Size 10 × 7, pp. x. and 230.

A new edition of the text of an anonymous latin poem on Mount Etna, with German translation, and an explanatory commentary on the detailed descriptions of the volcanic phenomena of the mountain which it contains. The commentator believes that these descriptions are founded on Posidonius.

Historical—Hannibal's Journeys. *Riv. G. Italiana* **5** (1898): 299–305. **Grasso.**

Sui limiti dell' Insula allobrogica. Nota di Gabriele Grasso.

Discussion as to the meaning of the word *Insula* as applied to the dwelling-place of the Allobrogians encountered by Hannibal after crossing the Alps.

Historical—Maps. *B.S.G. Com. Bordeaux* **21** (1898): 225–230. **Duffart.**

Carte de Masse (1707–1724). Par Ch. Duffart.

On the discovery of two unpublished sheets of a map of part of the landes.

BIOGRAPHY.

Biographical Dictionary. **Lee.**

Dictionary of National Biography. Edited by Sydney Lee. Vol. liii. Smith—Stanger; vol. liv. Stanhope—Stovin; vol. lv. Stow—Taylor. London: Smith, Elder, & Co., 1898. Size 10 × 7, pp. (vol. liii.) vi. and 486; (vol. liv.) vi. and 446; (vol. lv.) vi. and 486. *Price (each vol.)* 15*s.*

Vol. liii. includes notices of the following names of geographical interest: John Smith, by J. A. Doyle; Admiral William Henry Smyth, by Prof. J. K. Laughton; William Parker Snow, by the same; Sir George Somers, by Sidney Lee; Mary Somerville, by Miss Clerke; John Hanning Speke, by William Carr; Vice-Admiral T. A. B. Spratt, by Prof. J. K. Laughton; Richard Spruce, by G. S. Boulger; and William Grant Stairs, by Colonel R. H. Vetch, C.B. Vol. liv.—Bishop Edward Steere, by C. A. Harris; Henry Aaron Stern, by the Rev. W. G. D. Fletcher; W. B. Stevenson, by E. Irving Carlyle; and John Lort Stokes, by Prof. J. K. Laughton. Vol. lv.—Sir Paul Edmund de Strzelecki, by T. Seccombe; John McDouall Stuart, by C. A. Harris; Charles Sturt, by Mrs. Napier Sturt; and Sir Bartholomew James Sulivan, by Prof. J. K. Laughton.

Hænke. **Ballivian and Kramer.**

Tadeo Hænke escritos precedidos de algunos apuntes para su Biografia y acompañados de varios documentos ilustrativos. Por M. V. Ballivian y Pedro Kramer. La Paz: 1898. Size 8½ × 6, pp. xxxviii. and 114. *Presented by the Author.*

Biography of the Bohemian traveller Thaddeus Hænke, born 1761, who travelled largely in South America, and died in 1817, followed by an account of his travels and writings.

Michelet. *Rev. G.* **42** (1898): 451–455. **Corcelle.**
Michelet géographe, à propos de son centenaire (Juin 1898). Par J. Corcelle.

Mueller. *P.R.S.* **63** (1898): xxxii.–xxxvi. **[Hooker.]**
Baron Ferdinand von Mueller. By J. D. H.

Ortelius. *Deutsche Rundschau G.* **20** (1898): 467–472. **Wolkenhauer.**
Abraham Ortelius. Von Dr. W. Wolkenhauer. *With Portrait.*

Sievers. *Deutsche Rundschau G.* **20** (1898): 424–425. ———
Dr. G. J. Sievers. *With Portrait.*
Dr. Sievers, born 1843, died 1898, was for a time associated with Dr. Radde in the exploration of the Caucasus.

Sohncke. *Deutsche Rundschau G.* **20** (1898): 472–473. ———
Leonhard Sohncke. *With Portrait.*
Prof. Sohncke was born in 1842, died in 1897. He was a physicist, much interested in questions of meteorology and physical geography.

Steeb. *Deutsche Rundschau G.* **20** (1898): 421–424. ———
Feldmarschall-Lieutenant Christian R. v. Steeb. *With Portrait.*
The subject of this memoir was Director of the Military and Geodetic Institute in Vienna.

Vasco da Gama. *Rev. G. Italiana* **5** (1898): 259–276. **Toni.**
Vasco di Gama. Per M. G. Toni.

Vischer. *M. k.k. G. Ges. Wien* **41** (1898): 380–393. **Altinger.**
Des österreichischen Geographen Georg Matthaeus Vischer letztes Lebensjahr. Von Dr. P. Altmann Altinger. *With Plates.*
Vischer died in 1696, and various obscure passages in his life are now cleared up by the discovery of documents.

GENERAL.

Ballooning. *C. Rd.* **127** (1898): 135–138. **Bort.**
Résultats des ascensions des trois ballons-sondes lancés à Trappes le 8 juin. Note de M. L. Teisserenc de Bort.

Educational. **Redway and Hinman.**
The Natural Geographies. Natural Advanced Geography. By Jacques W. Redway and Russell Hinman. New York: American Book Co. [1898]. Size 12½ × 10½, pp. 160. *Maps and Illustrations. Presented by J. W. Redway, Esq.*
A note will be given on this work.

Geographical Progress. *G.Z.* **4** (1898): 305–320. **Hettner.**
Die Entwicklung der Geographie im 19 Jahrhundert. Von Alfred Hettner.
Prof. Hettner's Inaugural Address on being appointed to the new Chair of Geography in the University Tübingen.

Hamburg Geographical Society. *M.G. Ges. Hamburg* **14** (1898): 1–43. **Friederichsen.**
Rückblick auf die Gründung und Entwickelung der Geographischen Gesellschaft in Hamburg während der ersten fünfundzwanzig Jahre ihres Bestehens. Von L. Friederichsen.
A history of the Hamburg Geographical Society, which was founded in 1873.

Oriental Art. ———
The Collection of Oriental Objects of Art of Sir Rutherford Alcock, K.C.B. Size 10 × 6½, pp. 72.

Place-names. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 75–79. **Bielawski.**
Die Schreibung geographischer Namen nach russischen Kartenwerken. Von Josef Bielawski.

Place-names. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 67–74. **Levačić.**
Die Schreibung der geographischen Namen auf der Balkan-Halbinsel. Nach einer Studie des R. u. R. Hauptmannes Johann Levačić.

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(*E. Stanford, Agent.*)

England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 34, Dorset. J. Bartholomew & Co., Edinburgh, 1898. *Price* 2*s.*, *mounted on cloth. Presented by the Publishers.*

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Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1897. Sheets: 296, Frankfurt; 346, Grünberg. Scale 1 : 100,000 or 1·7 stat. miles to an inch. *Price* 1.50 *marks each sheet.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College

and Lecturer in Diplomatic in the University of Oxford. Part xix. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde. M.A.; Edinburgh: W. & A. K. Johnston, 1898. *Price* 3*s.* 6*d.* each part. *Presented by the Clarendon Press.*

This part contains: Map 36, Germany in the Later Middle Ages (1273–1492), by the Editor; Map 73, The Eastern Roman Empire (1025–1472), by Prof. Bury, LITT. D.; Map 87, European Colonies and Dependencies, 1763, by Hugh E. Egerton, M.A. Each of these maps is accompanied by explanatory letterpress.

Hungary. **Toldi.**

General-Karte der Länder der ungarischen Krone mit Angabe der politischen Eintheilung und statistischen Daten der neuesten Volkszählung. Scale 1 : 1,152,000 or 18·2 stat. miles to an inch. Von Ludwig Toldi (vorm B. Nagel), Budapest. *Price* 3 *marks.*

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Plan of Liverpool. Scale 1 : 12,672 or 300 yards to an inch. By J. Bartholomew, F.R.G.S. Published by W. H. Smith & Sons, London, 1898. *Price* 2*s. Presented by Messrs. J. Bartholomew & Co.*

Russia. **Langhans.**

Die deutschen Mennoniten-Kolonien in Süd-Russland. Scale 1 : 500,000 or 7·9 stat. miles to an inch. Von Paul Langhans. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 12. Gotha: Justus Perthes. *Presented by the Publisher.*

ASIA.

Asia Minor. **Diest.**

Karte der wichtigsten Nachbargebiete der anatolischen Eisenbahn-Linien. Nach eigenen Aufnahmen in den Jahren 1886, 1892 u. 1896 sowien ach unveröffentlichten Skizzen des Dr. Alfred Korte u. sonstigen neuen Beiträgen auf Prof. Heinrich Keiperts Grundlage neu zusammengestellt von Walther von Diest. Scale 1 : 250,000 or 4 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrgang 1898, Ergänzungsheft, No. 125, Tafels 1, 2, and 3. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

AFRICA.

Congo State. **Du Fief.**

Carte de l'État Indépendant du Congo, dressée d'après les itineraires originaux des voyageurs. Par J. du Fief, Secrétaire-général de la Société royal belge de géographie. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. 4 sheets. *Presented by the Author.*

This is the third edition of du Fief's map of the Congo Free State. It has been corrected where necessary to bring it up to date, and contains two additional insets, showing the termini of the railway at Matadi on the Congo, and Dolo on Stanley Pool. The routes of all the principal travellers are shown in red, and the dates of their explorations are given.

AMERICA.

United States. **U.S. Geological Survey.**

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These folios are accompanied by full descriptive letterpress, sections, and illustrations. The maps are given, first showing the topographical features, and then geologically coloured.

Venezuela. **Sievers.**

Originalkarte der Caños im Oriente von Venezuela. Nach eigenen Reisen und Richard Ludwigs Aufnahmen gezeichnet von W. Sievers. Scale 1 : 425,000 or 6·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 10. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

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Brisbane. **Pugh.**

Map of Brisbane and Suburbs. Published by Gordon and Gotch, Brisbane, with Pugh's Almanac, 1898.

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Map of Queensland. Compiled and lithographed from official maps. Scale 1: 2,977,920 or 47 stat. miles to an inch. Published by Gordon & Gotch, Brisbane, with Pugh's Almanac, 1898.

GENERAL.

Flag Diagram. **Brown.**

Royal Victorian Edition: Flags of Britain and her Colonies; also the Standards and Flags of all Nations. James Brown & Son, Glasgow, 1898. *Price* 1*s.* *Presented by the Publishers.*

Meteorological. **Supan.**

Verteilung der mittleren jährlichen Regenmenge auf der Erdoberfläche. Von Alexander Supan. Equatorial Scale 1: 100,000,000 or 1578 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 13. Gotha: Justus Perthes. *Presented by the Publisher.*

Terrestrial Magnetism. **Schmidt.**

Linien gleicher Werte der rechtwinkeligen Komponenten der erdmagnetischen Kraft zur Epoche 1895. Von Dr. Adolf Schmidt. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 11. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig: Verlag von Velhagen & Klasing, 1898.—Lief 24, Nord- und Mittelbayern; Frankreich, Uebersicht.—Lief 25, Kaukasusländer; Palastina; Britisch Nordamerika.—Lief 26, Provinz Schlesien; Vorderindien, Südlicher Teil; Burma und Malayische Halbinsel.—Lief 27, Hessen—Nassau, Grossherzogtum Hessen und Fürstentum Waldeck; Frankreich, Nördliche Hälfte; Nördlicher und Südlicher Sternhimmel. Das Sonnensystem. Mondkarte; Thüringische Staaten.—Lief 29, Nordamerika; Neuguinea und der Bismarckarchipel, Die Sudseeinseln.

World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts, issued fortnightly. Parts 12, 13, and 14. *Price* 6*d. each.*

CHARTS.

United States Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic and North Pacific Oceans for August and September, 1898. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

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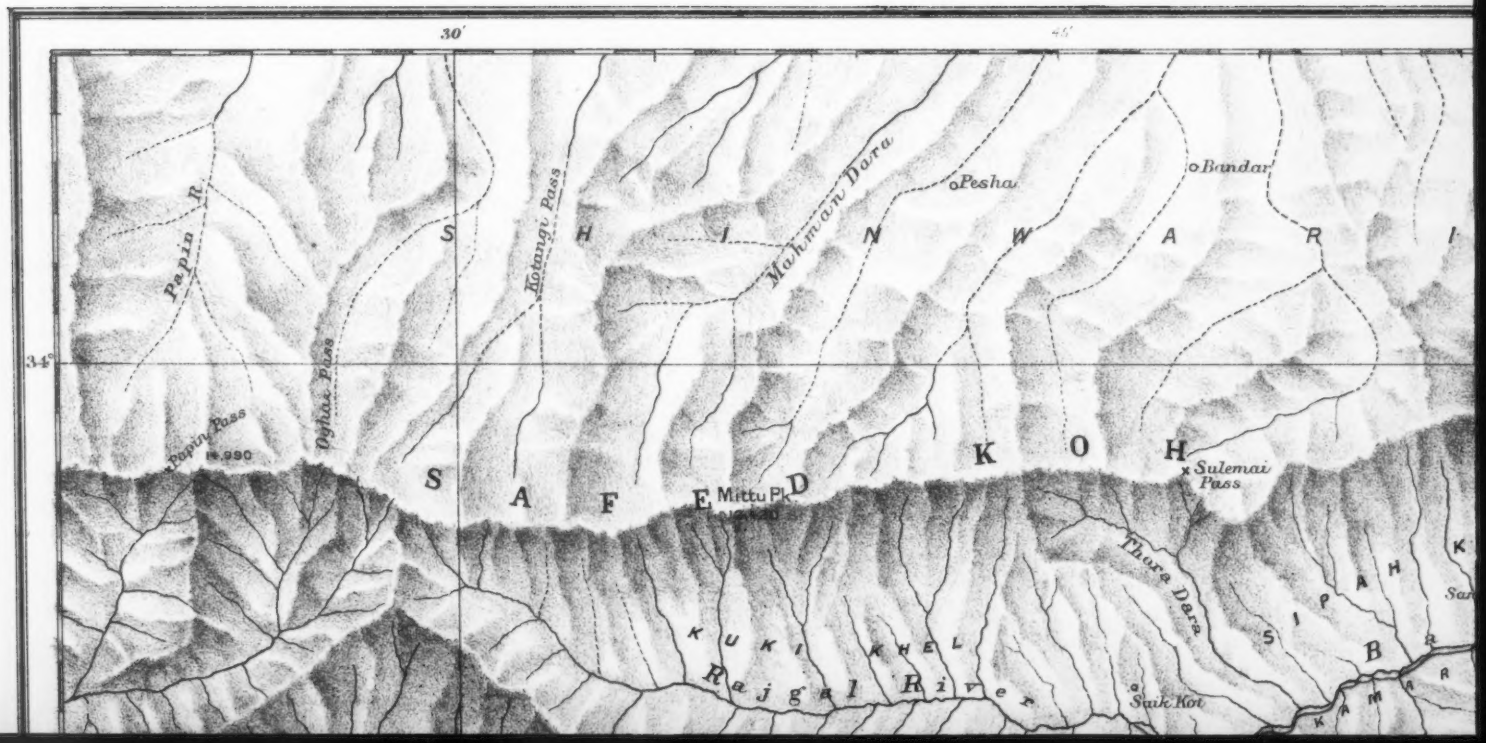
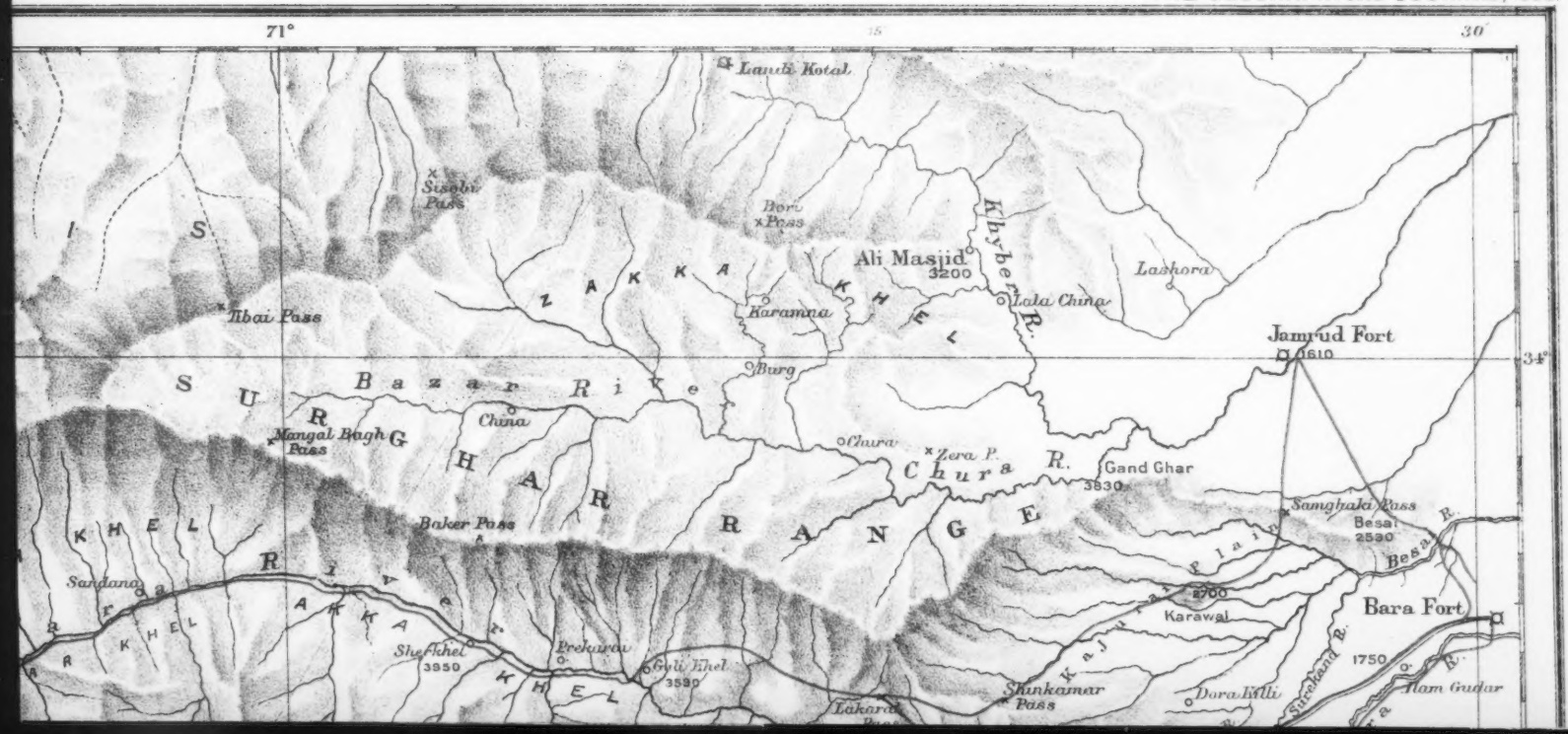
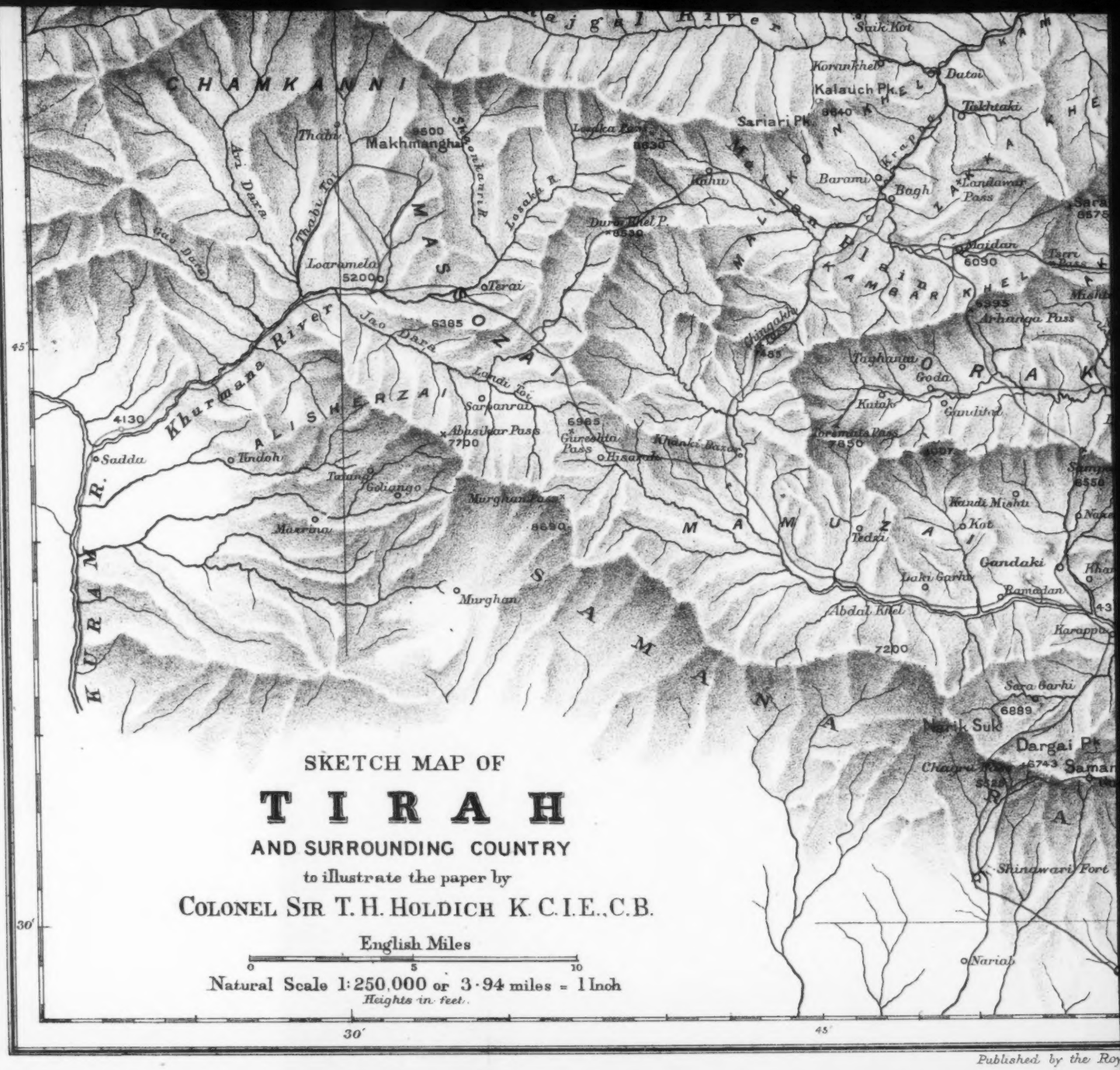
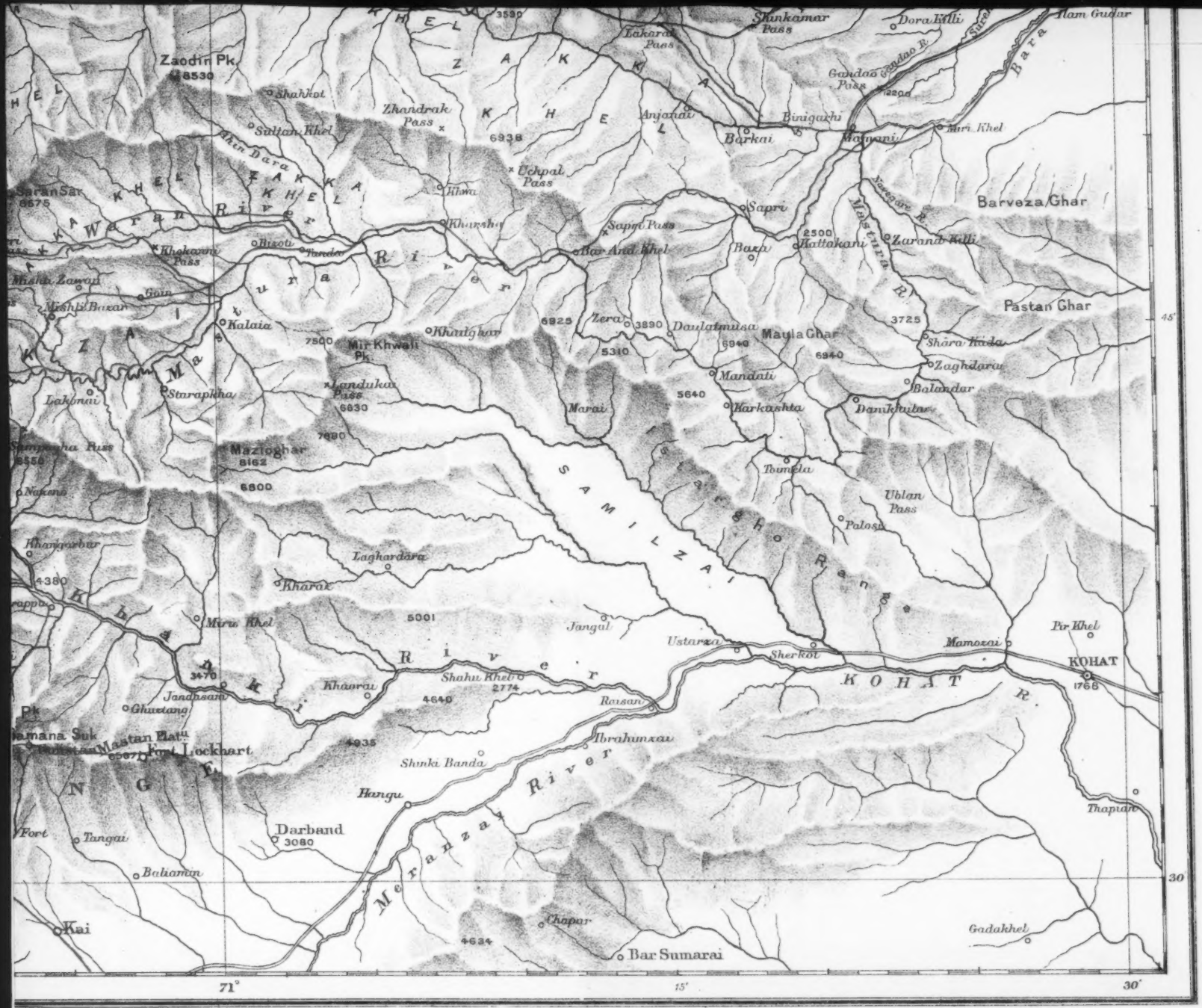

30'
34°
Pepin R.
Papin Pass
Ogbai Pass
Kotangi Pass
Mahmand Dara
Pesha
Bandar
SHINWARI
SAFED KOH
Mittu Pk
Sulemai Pass
Thura Dara
KUKI KHEL
Rajgal River
Saik Kot
SIPAH
KAMA


71°
30'
34°
Landi Kotal
Sisobi Pass
Boru Pass
Ali Masjid
3200
Khyber R.
Lashora
Lala China
Karamna
ZAKKA KHEL
Tibai Pass
Jamrud Fort
1610
Burg
SUR GHAR RANGE
Bazar River
China
Mangal Bagh Pass
Chura
Zera P.
Chura R.
Gand Ghar
3830
Samghaka Pass
Besai
2530
Besai R.
Baker Pass
KHEL
Sandana
Karawal
2700
Bara Fort
1750
AKKA KHEL
Shafchel
3950
Prekarai
Gidi Khel
3530
Kajuri Plain
Skinkamar Pass
Dara Kili
Surkhab R.
Ham Gudar
Lakarai


CHAMKANNI
MASOZAI
ALISHERZAI
MAMUZAI
SAMANA
KHARAKHEL
MALIKDIN KHAMBAR KHEL
ORAKZAI
Thabi
Makhmangha
Loaramela
5200
Terai
Jao Dara
6385
Khurmana River
Sadda
Indoh
Tatang
Gobiango
Murghan Pass
8690
Murghan
Marrina
Sarkanrai
Abusikar Pass
7700
Gureshta Pass
6965
Hisarak
Khanki Bazar
Londi Toi
Thabi Toi
Loaramela
Sheinkanri R.
Losaka R.
Ara Dara
Gau Dara
Saik Kot
Koranikhel
Datoi
Kalauch Pk.
8640
Takhtaki
Sariari Pk.
Barami
Bagh
Landawai Pass
Maidan
6090
Arhanga Pass
Tanhana
Goda
Kutak
Gandital
Kandi Mishti
Kot
Tedza
Gandaki
Laki Garhi
Ramadan
Abdal Khel
7200
Sara Garhi
6889
Narik Suk
Dargai Pk.
Shinawari Fort
Narial
SKETCH MAP OF
TIRAH
AND SURROUNDING COUNTRY
to illustrate the paper by
COLONEL SIR T. H. HOLDICH K.C.I.E., C.B.
English Miles
0 5 10
Natural Scale 1:250,000 or 3·94 miles = 1 Inch
Heights in feet.
30'
45'
Published by the Roy



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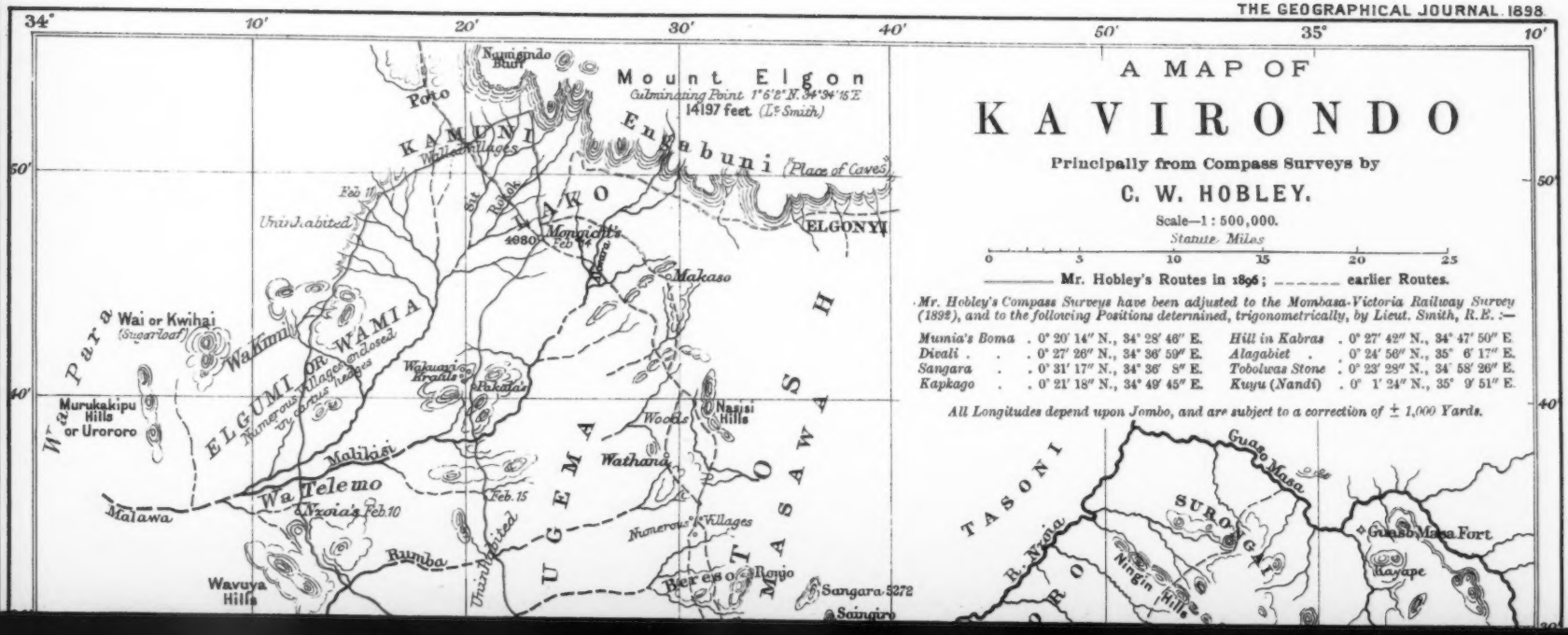
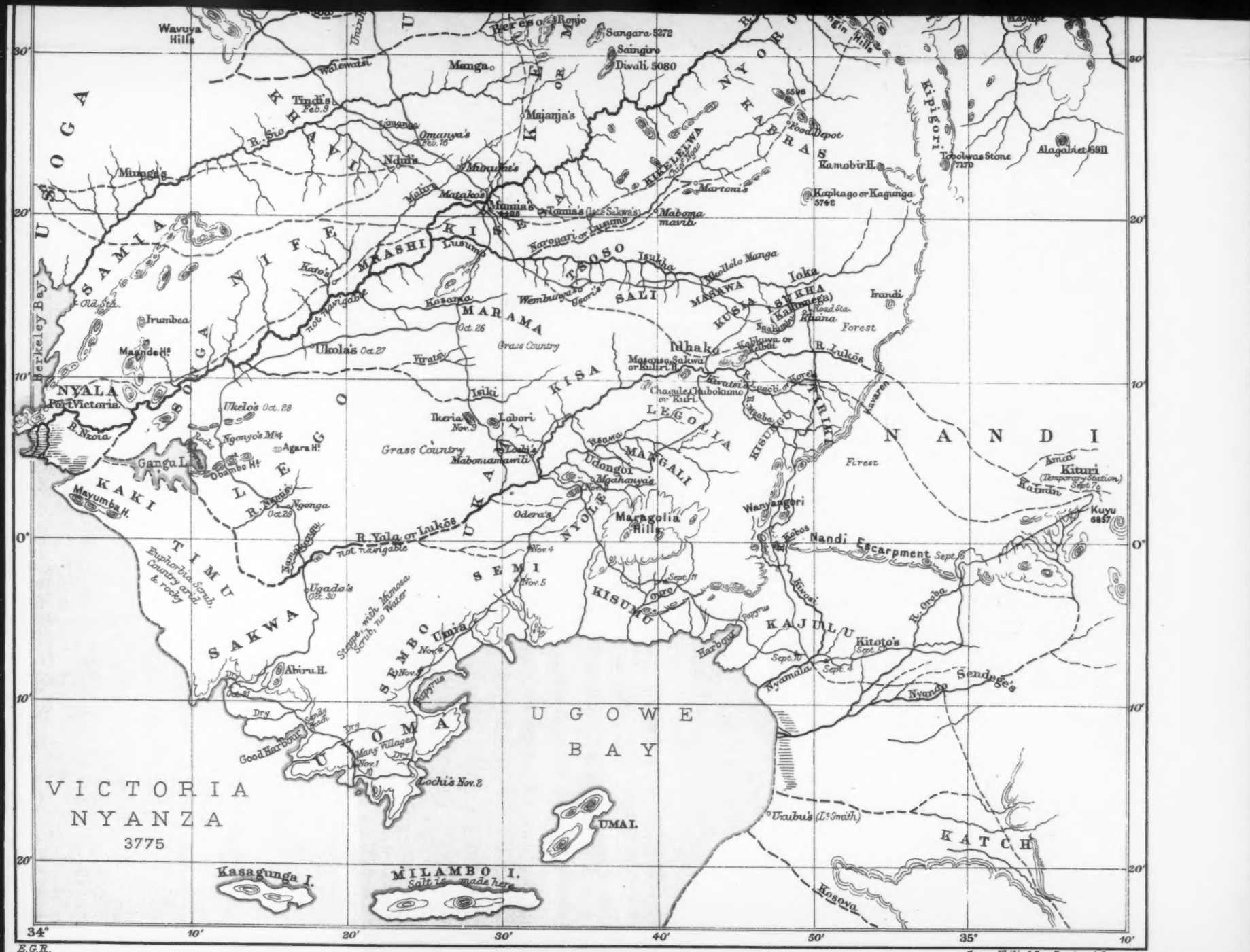
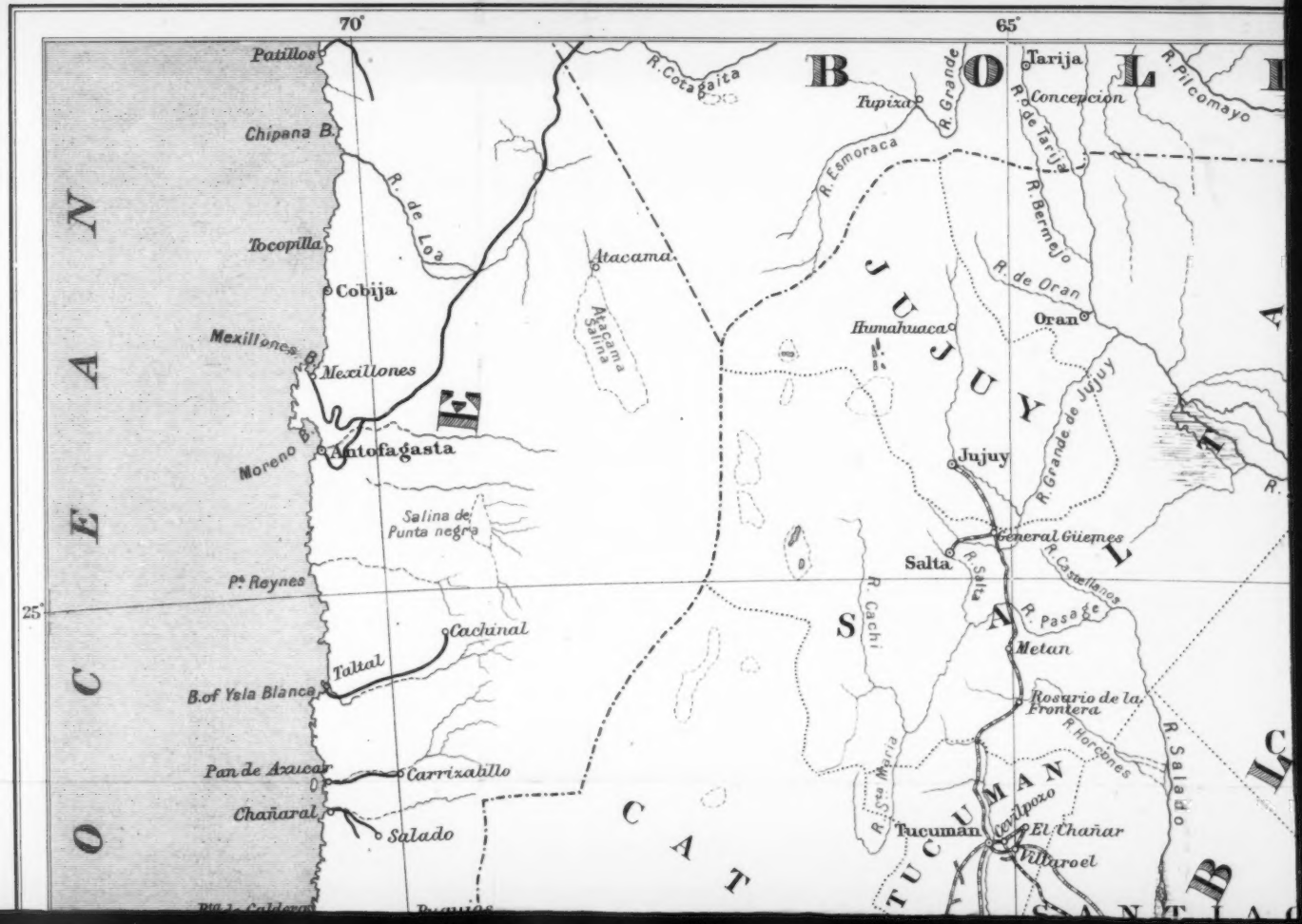
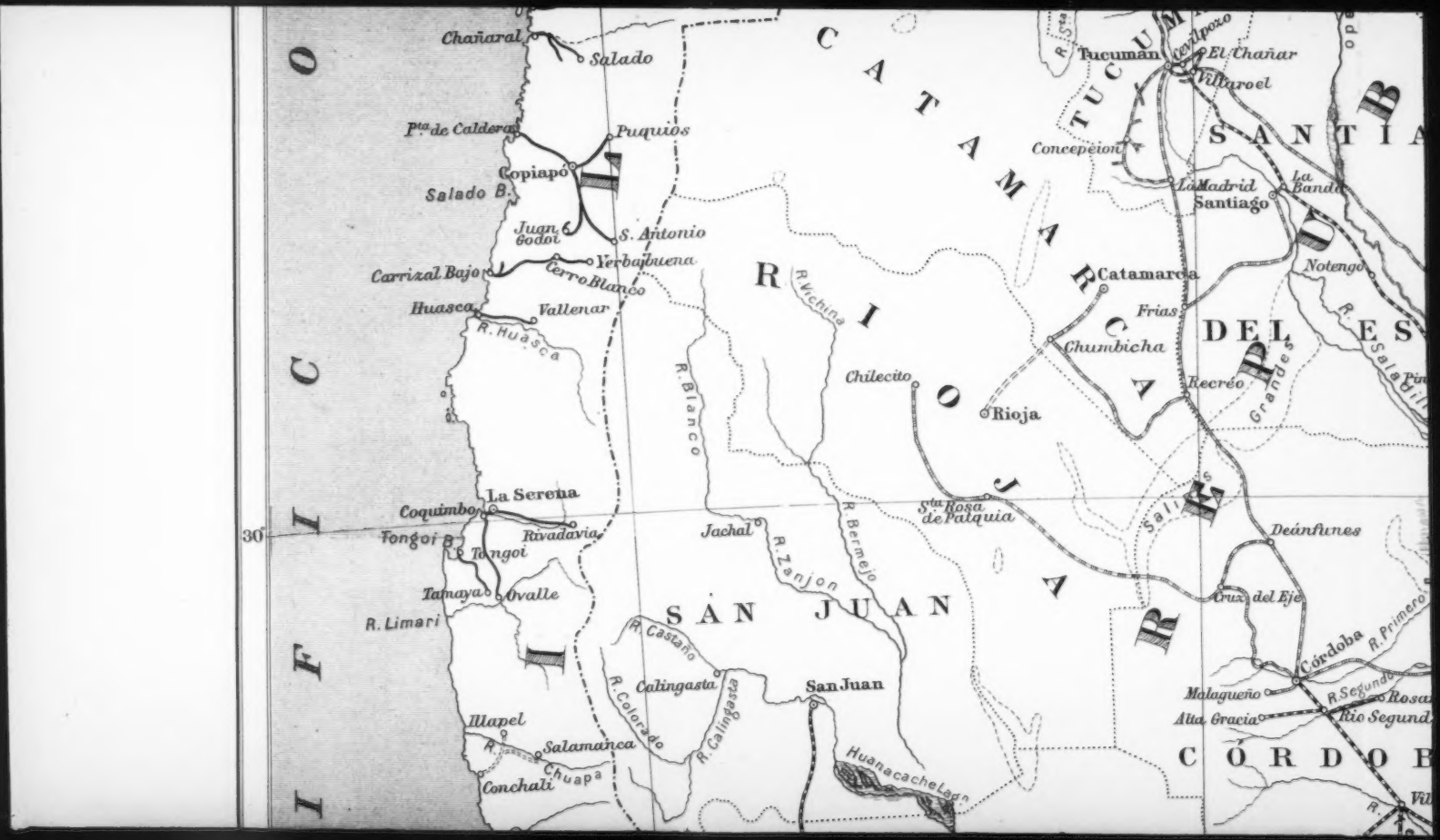
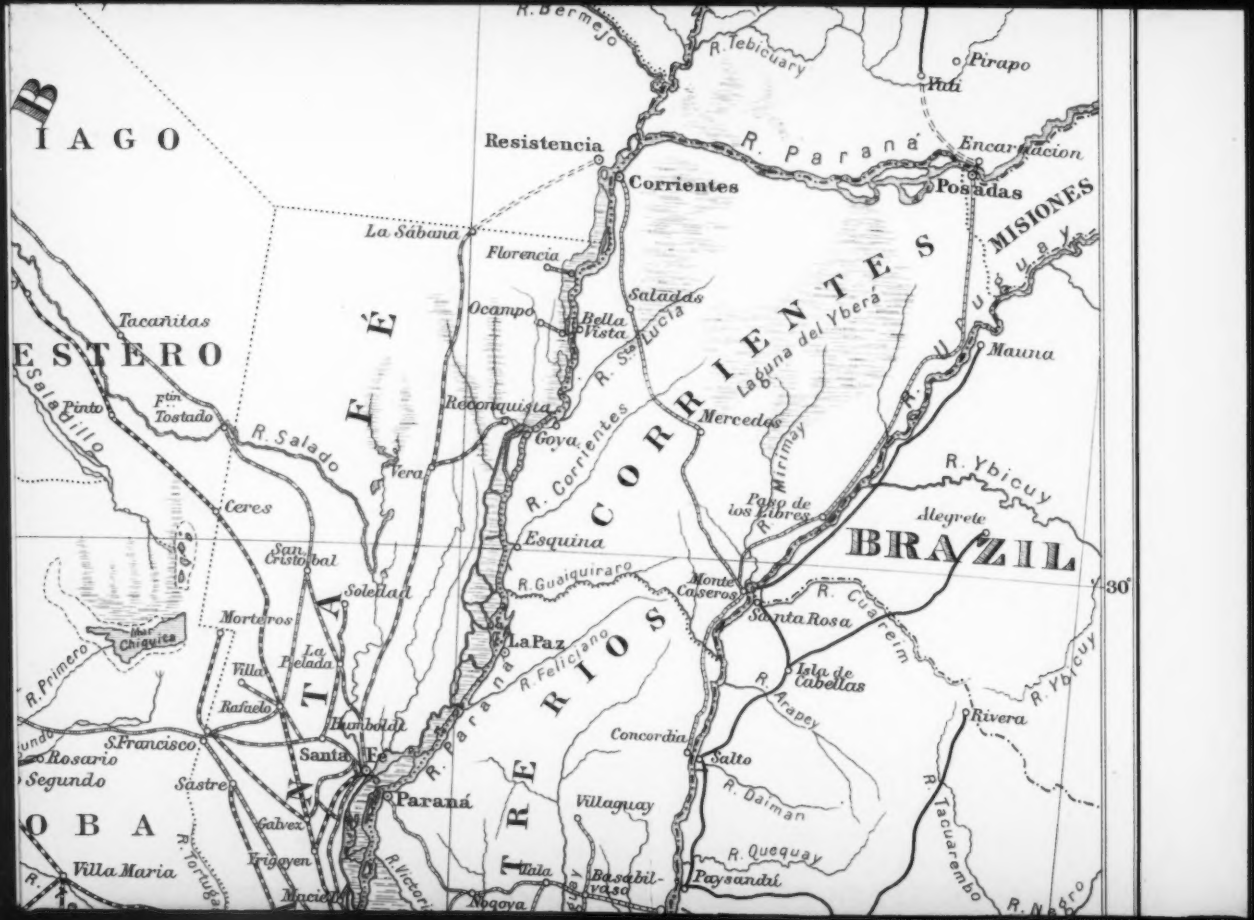

34°
10'
20'
30'
40'
50'
35°
10'
50'
40'
Mount Elgon
Culminating Point 1° 6' 2" N. 34° 34' 15" E.
14197 feet. (Lt. Smith.)
Namirndo Butt
Poko
KAMUNI
Wattled Villages
Endabuni (Place of Caves)
ELGONYI
Feb 11
Uninhabited
Sirikwa Road
1080
Mongicht's
Feb 14
Makaso
Wai or Kwihai
(Sugarloaf)
Wa Para
WaKimili
WAMIA
ELGUMI OR WAMIA
Numerous Villages enclosed in Cactus hedges
Wajumia Kraals
Pakatas
Murukakipu Hills or Urororo
Woods
Nasisi Hills
Malikisi
Wathana
Wa Telemo
Vzoia's Feb 10
Feb. 15
Malawa
Numerous Villages
Rumba
Uninhabited
UGEMA
MASAWA
Wavuya Hills
Rangwe
Sangara 3272
Saingiro
A MAP OF
KAVIRONDO
Principally from Compass Surveys by
C. W. HOBLEY.
Scale—1 : 500,000.
Statute Miles
0 5 10 15 20 25
Mr. Hobley's Routes in 1896; earlier Routes.
Mr. Hobley's Compass Surveys have been adjusted to the Mombasa-Victoria Railway Survey (1898), and to the following Positions determined, trigonometrically, by Lieut. Smith, R.E.:—
Munia's Boma . 0° 20' 14" N., 34° 28' 46" E.
Divali . . 0° 27' 26" N., 34° 36' 59" E.
Sangara . . 0° 31' 17" N., 34° 36' 8" E.
Kapkago . . 0° 21' 18" N., 34° 49' 45" E.
Hill in Kabras . 0° 27' 42" N., 34° 47' 50" E.
Alagabiet . . 0° 24' 56" N., 35° 6' 17" E.
Tobolwas Stone . 0° 23' 29" N., 34° 58' 26" E.
Kuyu (Nandi) . 0° 1' 24" N., 35° 9' 51" E.
All Longitudes depend upon Jombo, and are subject to a correction of ± 1,000 Yards.
TASONI
R. Nzoia
Guabi Musa
SUROGAT
Guaba Musa Fort
Kayape
Ningin Hills


VICTORIA NYANZA
3775
UGOWE BAY
UMAI.
MILAMBO I.
Salt is made here
Kasagunga I.
NYALA or Port Victoria
Berkeley Bay
Wavuya Hills
Irumbea
Old Sta.
Masinde H.
Ukola's Oct. 27
Ukelo's Oct. 28
R. Nzoia
Gangu L.
Obambo H.
Agara H.
Ngonyo's Mt.
Mayumba H.
R. Yala or Lukōs
not navigable
Ugada's Oct. 30
Ngonga
Oct. 29
Abiru H.
Good Harbour
Many Villages
Lochi's Nov. 2
Ugoma
Uma
Nov. 4
Nov. 1
Nov. 2
Nov. 3
Nov. 5
Sept. 11
Sept. 10
Sept. 4
Sept. 5
Sept. 6
Sept. 7
Sept. 8
Oct. 26
Oct. 23
Oct. 22
Oct. 21
Grass Country
Forest
Stepppe, with Mimosa Scrub, no Water
Euphorbia Scrub, Country arid & rocky
Papyrus
Harbour
Waluwasi
Manga
Tindi's Feb. 3
Omanya's Feb. 16
Ndua's
Munga's
Matako's
Mumia's
Tomia's (late Sakwa's)
Majanja's
Mabamawia
Lusumo
Kato's
not navigable
Kasama
Wembuya's
Geori's
Virata
Ikeria
Isiki
Labori
Nov. 3
Lodi's
Mabomamawili
Ukelo's Oct. 28
Ngonyo's Mt.
Agara H.
Obambo H.
Ngonga
Oct. 29
Odera's
Maragolia Hills
Udongoi
Mgahanya's
Kisoma
Chagule (Chubokumo or Kuri)
Masanso (Sakwa or Kuliri H.)
Kiratsi's
Ingoba
Kavaren
Idhako
Kabkuwa or Kabul
Saoko
Kisana
Forest
R. Lukōs
Irandi
Kaimera)
Road Sta.
Isukha
Mkallolo Manga
Isukha
Kamobur H.
Kapkago or Kaguiga
5742
Martoni's
Kipigori
Food Depot
5548
Toolowas Stone
7170
Alagaliet 6911
Kipkelelwa
Tea Estate
Kisumu
Kisian
Kisian
Kisian


70°
65°
25°
Patillos
Chipana B.
Tocopilla
Cobija
Mexillones B.
Mexillones
Moreno B.
Antofagasta
Pª Reynes
Cachinal
Taltal
B.of Ysla Blanca
Pan de Azucar
Carrizalillo
Chañaral
Salado
Salina de Punta negra
R. de Loa
R. Cotagaita
Atacama
Atacama Salina
Tupiza
R. Grande
Tarija
Concepcion
R. Pilcomayo
R. de Tarija
R. Esmoraca
R. Bermejo
R. de Oran
Oran
Humahuaca
JUJUY
Jujuy
R. Grande de Jujuy
General Güemes
Salta
R. Salta
R. Cachi
R. Pasage
R. Castellanos
Metan
Rosario de la Frontera
R. Horcones
R. Salado
Tucuman
El Chañar
Villaroel
BOLIVIA
OCEAN
SALTA
CATAMARCA
TUCUMAN

60°
I V I A
Pilcomayo Marsh
R. Avelar
R. Mondego
BRAZIL
R. Apa
R. Galvan
P A R A
R. Negra
R. Aquidaban
R. Gualcuru
R. Verde
R. Ypane
R. Aguaray guazu
R. Jejuy
R. Pilcomayo
R. Bermejo
R. Tapiracuay
L. Ypoa
R. Manduvira
25°
ASUNCION
Villa Rica
Formosa
R. Negro
R. Bermejo
R. Tebicuary
Pirapo
Pati
CHACO


Chañaral
Salado
Pto de Caldera
Puquios
Copiapó
Salado R.
Juan Godoi
S. Antonio
Yerbabuena
Carrizal Bajo
Cerro Blanco
Huasco
Vallenar
R. Huasca
La Serena
Coquimbo
Rivadavia
Tongoi B.
Tongoi
Tamaya
Ovalle
R. Limari
Illapel
Salamanca
Chuapa
Conchali
R. Blanco
R. Vichina
Chilecito
Rioja
Jachal
R. Zanjon
R. Bermejo
Sta Rosa de Patquia
SAN JUAN
R. Castaño
Calingasta
R. Colorado
R. Calingasta
San Juan
Huanacache Lagn
CATAMARCA
Catamarca
Frias
Chumbicha
Recréo
Salls Grandes
LA RIOJA
Deánfunes
Cruz del Eje
Córdoba
R. Primero
R. Segundo
Malagueño
Alta Gracia
Río Segund
CÓRDOB
TUCUMAN
Tucuman
El Chañar
Villa Oel
Concepcion
La Madrid
La Banda
Santiago
SANTIA
Notengo
DEL ES
30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Corrientes
Posadas
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La Sabana
Florencia
Saladas
Ocampo
Bella Vista
Tacañitas
ESTERO
SANTA FÉ
CORRIENTES
R. Santa Lucia
Laguna del Yberá
R. Uruguay
Mauna
Saladillo
Pinto
Fin Tostado
R. Salado
Reconquista
Goya
Mercedes
R. Mirimay
R. Ybicuy
Vera
Ceres
R. Corrientes
Paso de los Libres
Alegrete
Esquina
BRAZIL
San Cristobal
R. Guaiquiraro
Monte Caseros
Soledad
Santa Rosa
R. Cuarein
Morteros
Mar Chiquita
La Paz
R. Primero
La Helada
Villa
Isla de Cabellas
R. Ybicuy
R. Paraná
R. Feliciano
Rafaelo
Humboldt
Concordia
Rivera
S. Francisco
Rosario
Santa Fe
Salto
R. Arapey
Segundo
Sastre
Paraná
ENTRE RIOS
Villaguay
R. Daiman
OBA
Galvez
R. Quequay
Iriggoyen
Villa Maria
R. Victoria
Basabilvaso
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R. Tacuarembo
R. Negro
Nogoya
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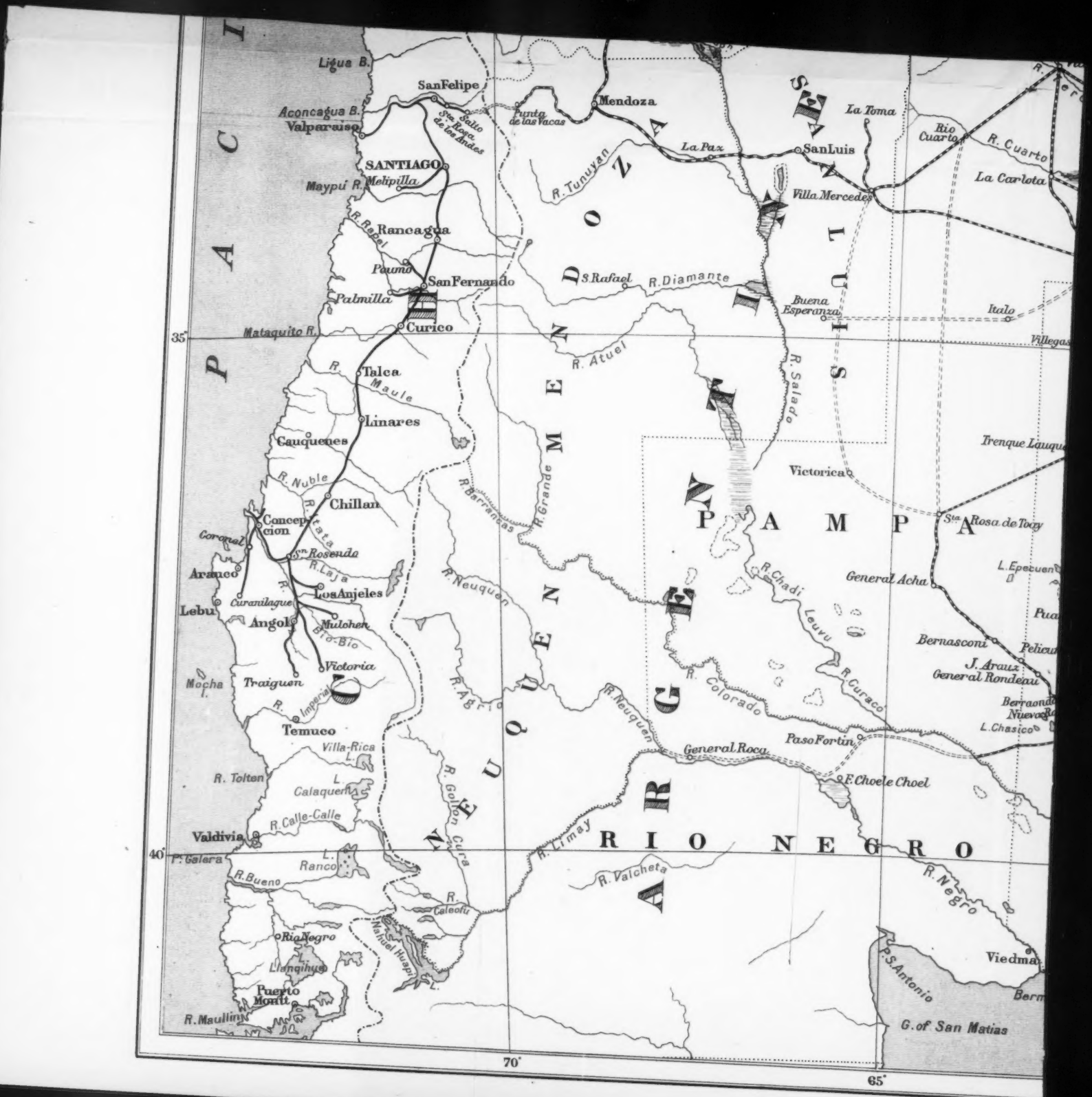
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SanFelipe
Aconcagua B.
Valparaiso
Sta. Rosa de Los Andes
Salto
Punta de las Vacas
Mendoza
La Toma
Rio Cuarto
R. Cuarto
La Carlota
SANTIAGO
Maypú R.
Melipilla
La Paz
SanLuis
R. Tunuyan
Villa Mercedes
R. Rapel
Rancagua
Paumo
SanFernando
S. Rafael
R. Diamante
Palmilla
Buena Esperanza
Italo
Curico
Mataquito R.
35°
Villegas
R. Atuel
R. Salado
R. Maule
Talca
Linares
Cauquenes
Trenque Lauquen
Victorica
R. Nuble
Chillan
R. Barrancas
R. Grande
Concepcion
Coronel
Sta. Rosa de Toay
Sn. Rosenda
R. Laja
Arauco
L. Epecuen
General Acha
Los Anjeles
R. Neuquen
R. Chadi Leuvu
Lebu
Curanilague
Angol
Mulchen
Bio-Bio
Bernasconi
Victoria
J. Arauz
General Rondeau
Mocha I.
Traiguen
R. Colorado
R. Curaco
R. Agrio
R. Neuquen
Berraondo
Nuevo
L. Chasico
R. Imperial
Temuco
Villa-Rica
L.
Paso Fortin
General Roca
R. Tolten
L. Calaqueni
F. Choele Choel
R. Golfon Cura
R. Calle-Calle
Valdivia
R. Limay
40°
P. Galera
L. Ranco
R. Bueno
R. Valcheta
R. Negro
R. Caleofu
Rio Negro
Nahuel Huapi
Viedma
Llanquihue
P. S. Antonio
Puerto Montt
R. Maullin
G. of San Matias
70°
65°
NEUQUEN
RIO NEGRO
ARGENTINE
PAMPA
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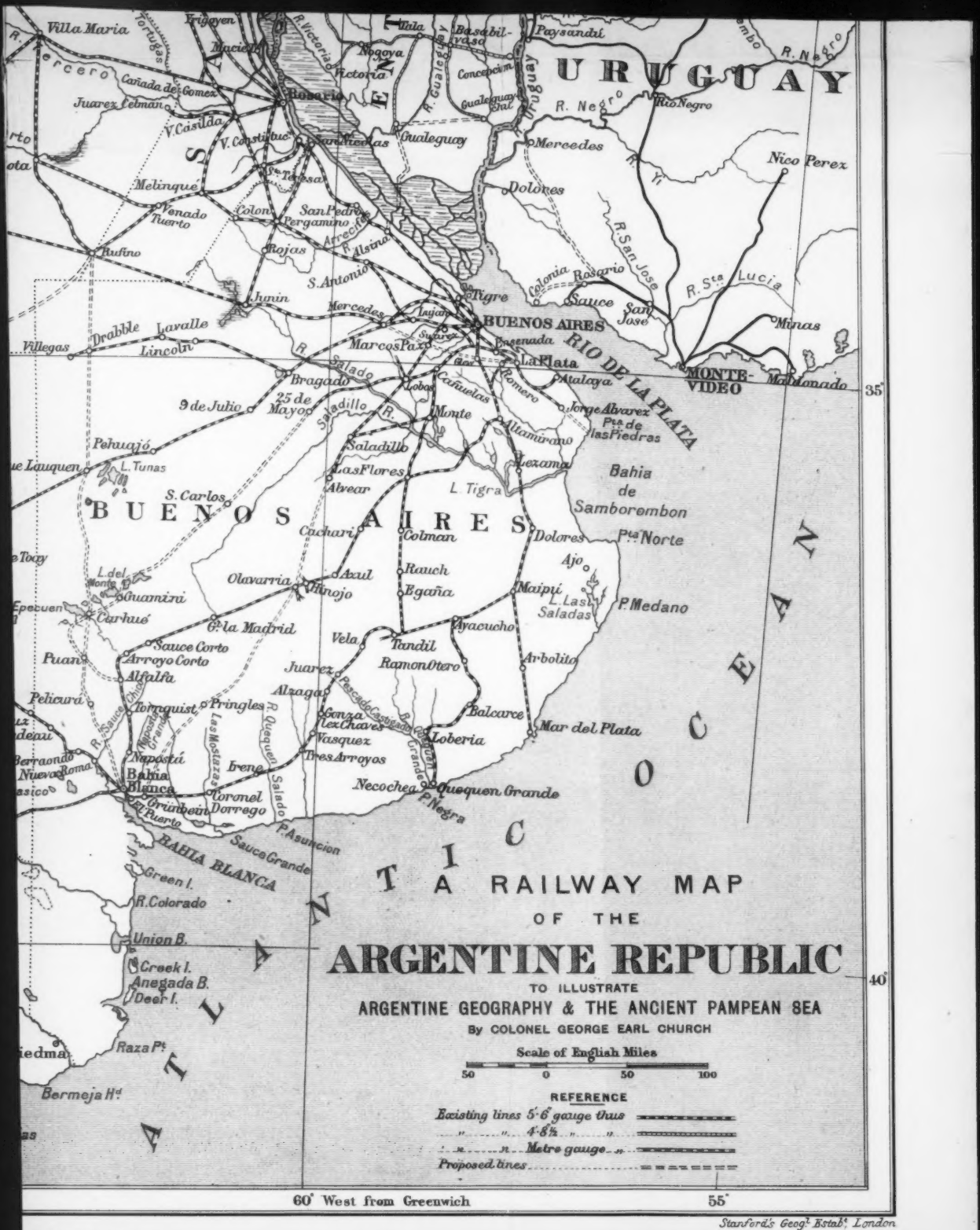
A RAILWAY MAP
OF THE
ARGENTINE REPUBLIC
TO ILLUSTRATE
ARGENTINE GEOGRAPHY & THE ANCIENT PAMPEAN SEA
By COLONEL GEORGE EARL CHURCH
Scale of English Miles
50 0 50 100
REFERENCE
Existing lines 5'6" gauge thus
4'8½ "
Metre gauge "
Proposed lines
URUGUAY
BUENOS AIRES
BUENOS AIRES
RIO DE LA PLATA
ATLANTIC OCEAN
Villa Maria
Rosario
Junin
Rufino
Pehuajó
S. Carlos
Bragado
9 de Julio
25 de Mayo
Chivilcoy
Mercedes
Lujan
Marcos Paz
Chascomus
Dolores
Tandil
Azul
Olavarria
Tapalqué
Bahia Blanca
Coronel Dorrego
Pringles
Tornquist
Napostá
Monte
Saladillo
Las Flores
Rauch
Balcarce
Mar del Plata
Necochea
Quequen Grande
Loberia
Ajo
Maipú
Arbolito
Ayacucho
Colman
Cachari
Alberdi
Concepcion
Gualeguay
Gualeguaychu
Paysandu
Mercedes
Dolores
Nico Perez
Colonia
Sauce
San Jose
Minas
Maldonado
MONTE-VIDEO
La Plata
Ensenada
Atalaya
Jorge Alvarez
Pta de las Piedras
Bahia de Samborombon
Pta Norte
P. Medano
L. Las Saladas
L. Tigra
Lezama
Altamirano
Cañuelas
Romero
Lobos
Suipacha
Navarro
Lujan
Tigre
Arrecifes
Pergamino
San Pedro
Colon
Venado Tuerto
Melincué
Carlota
Rojas
Junin
Chacabuco
Salto
Arrecifes
Baradero
San Nicolas
Ramallo
Pergamino
Rosario
Victoria
Nogoya
Villa
Basabilvaso
Gualeguay
Concepcion
Uruguay
R. Negro
Rio Negro
R. Santa Lucia
R. San Jose
R. Tercero
R. Victoria
R. Gualeguay
R. Uruguay
R. Negro
Tres Arroyos
Vasquez
Gonzalez Chaves
Ramon Otero
Juarez
Alzaga
Vela
Sauce Corto
Arroyo Corto
Alfalfa
Puan
Pelicura
Carhué
Guaminí
Epecuen
Olavarria
Azul
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Las Flores
Saladillo
Monte
Suipacha
Navarro
Lujan
Marcos Paz
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Dolores
Tandil
Azul
Olavarria
Bragado
9 de Julio
Junin
Rufino
Villegas
Drabble
Lavalle
Lincoln
Pehuajó
L. Tunas
S. Carlos
Cachari
Olavarria
Carhué
Puan
Pelicura
Berraondo
Nueva Roma
Bahia Blanca
Napostá
Irene
Coronel Dorrego
Grunbein
El Puerto
Sauce Grande
P. Asuncion
Necochea
Quequen Grande
P. Negra
Loberia
Balcarce
Mar del Plata
Arbolito
Ayacucho
Maipú
Ajo
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Romero
Lobos
Monte
Saladillo
Las Flores
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Azul
Olavarria
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Gualeguaychu
Concepcion
Victoria
Nogoya
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Basabilvaso
Paysandu
Rio Negro
R. Negro
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R. Gualeguay
R. Victoria
R. Tercero
R. Santa Lucia
R. San Jose
R. Negro
Rosario
Victoria
Diamante
Paraná
Gualeguaychu
Concepcion
Uruguay
Rio Negro
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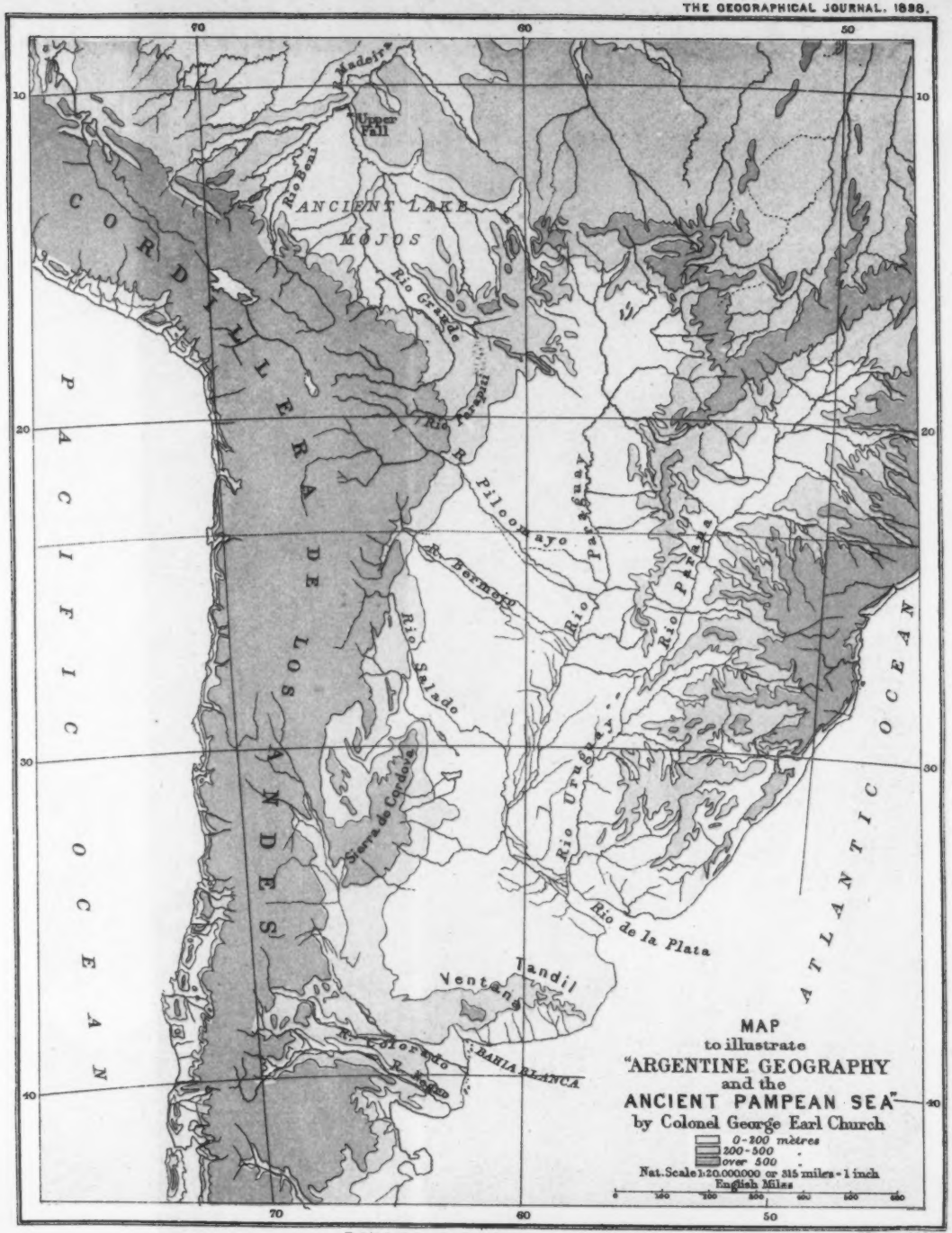

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J.G. Keeler F.R.G.S.

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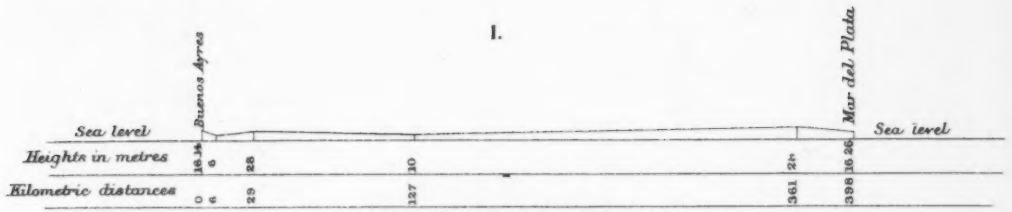
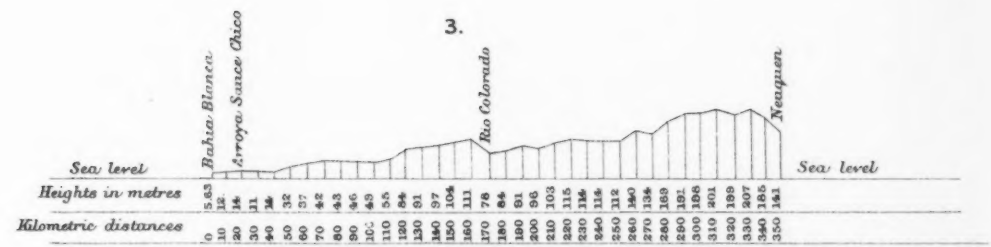
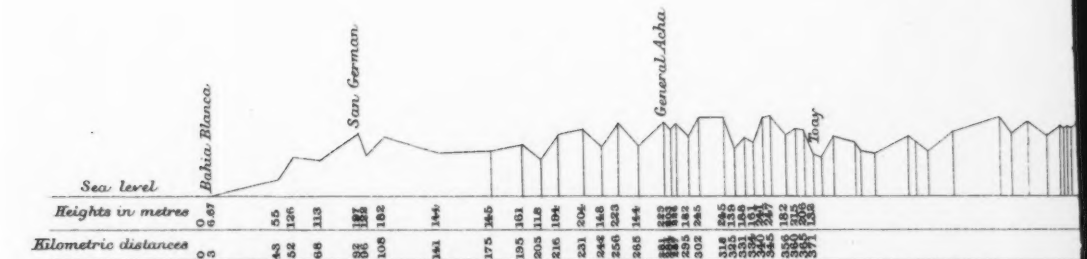


SOUTHERN RAILWAY (COASTLINE.)

3.

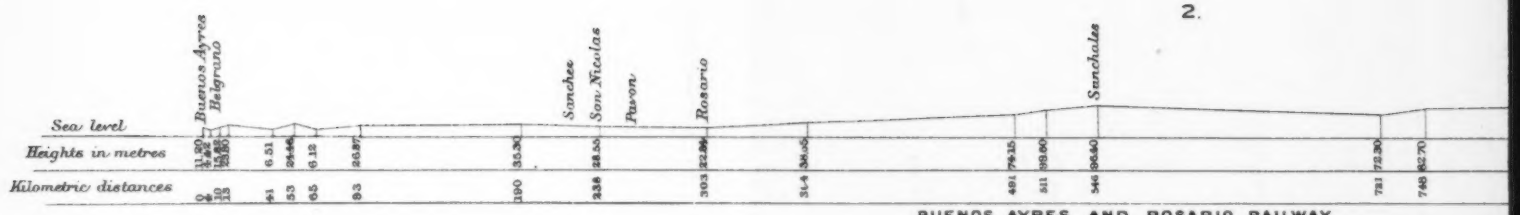


BAHIA BLANCA & NEUQUEN OR RIO NEGRO RAILWAY.



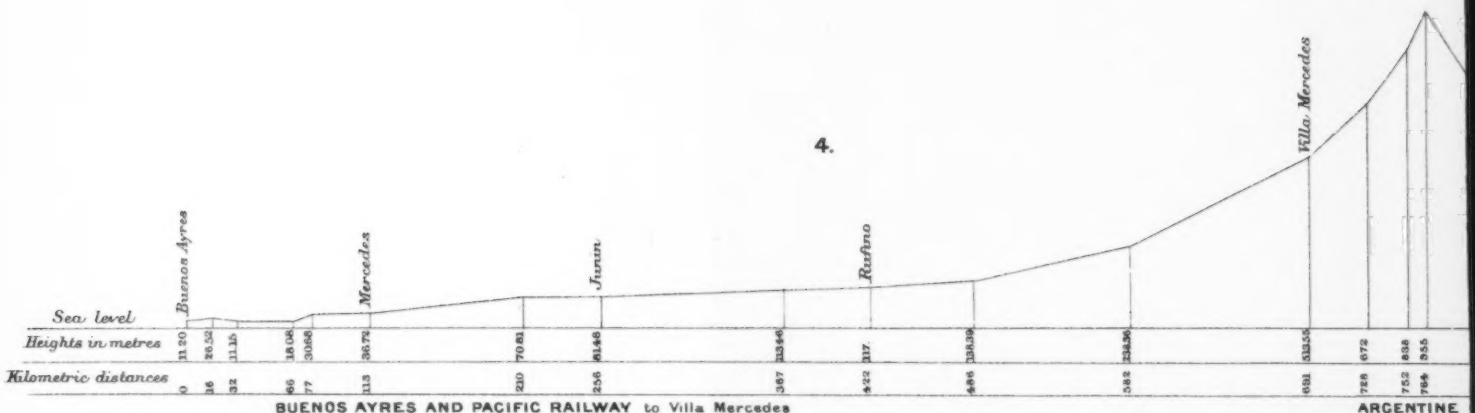
BAHIA BLANCA AND NORTH WESTERN RAILWAY.

2.



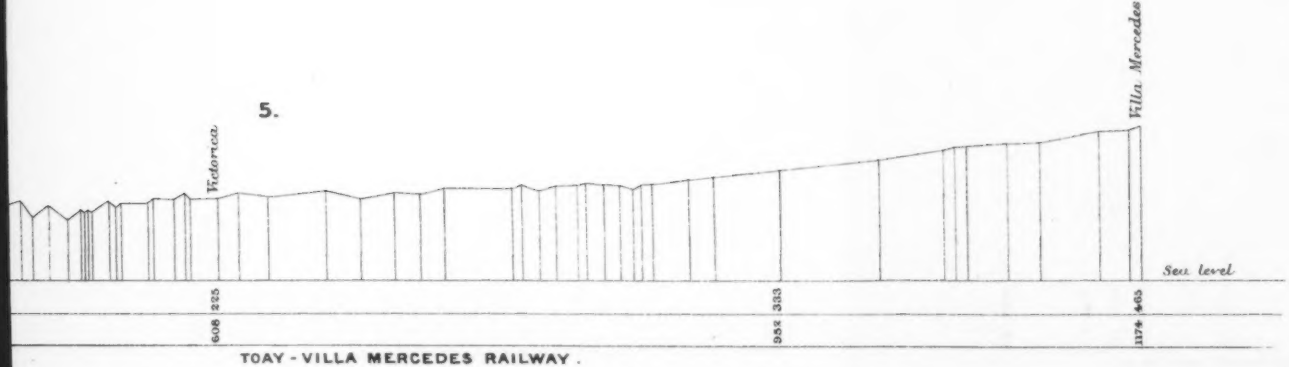
BUENOS AYRES AND ROSARIO RAILWAY.

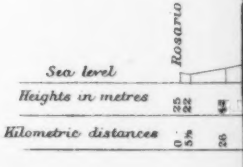
4.



BUENOS AYRES AND PACIFIC RAILWAY to Villa Mercedes ARGENTINE

5.





TOAY - VILLA MERCEDES RAILWAY.

Horizontal Scale. 1 : 20,000.
Vertical do. 1 : 4,000,000.

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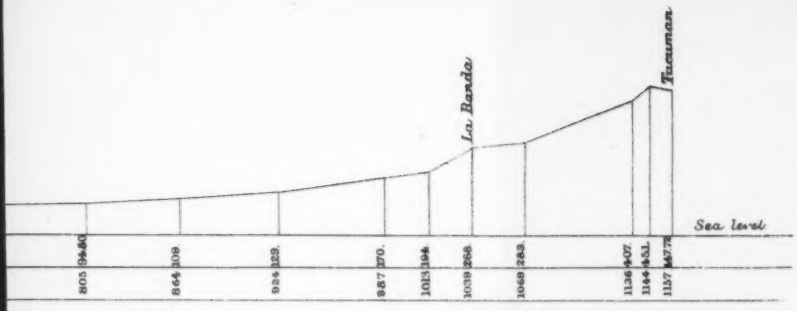
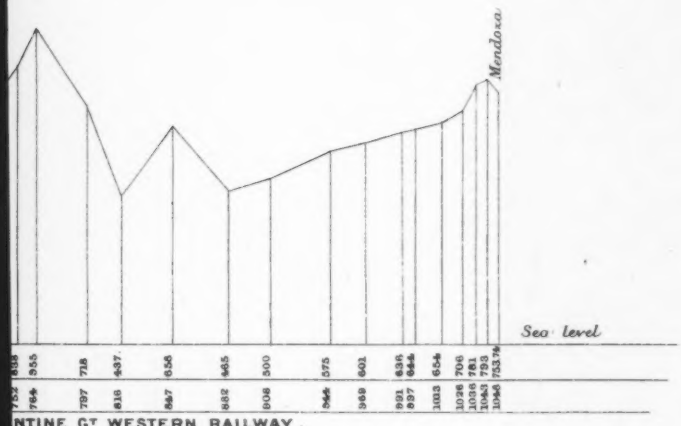
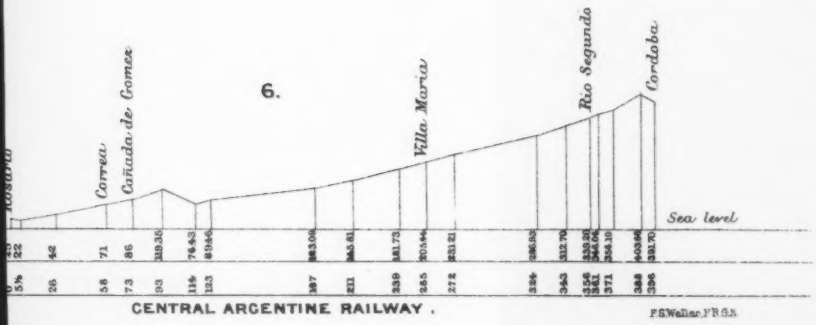




NTINE Gt WESTERN RAILWAY.

6.



CENTRAL ARGENTINE RAILWAY.

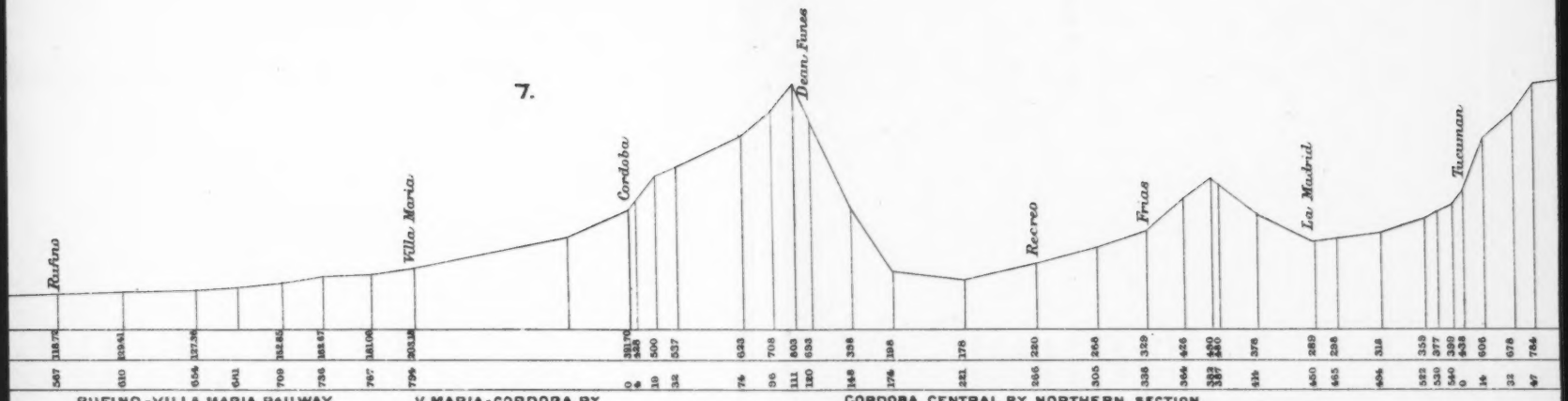
F.S.Weller, F.R.G.S.

BAHIA BLANCA-RUFINO RAILWAY

8.

WESTERN RAILWAY.

7.



RUFINO-VILLA MARIA RAILWAY V.MARIA-CORDOBA RY CORDOBA CENTRAL RY NORTHERN SECTION

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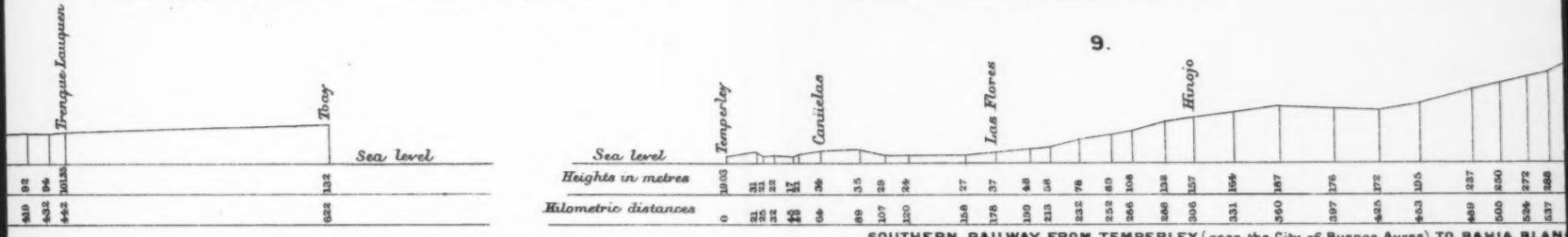
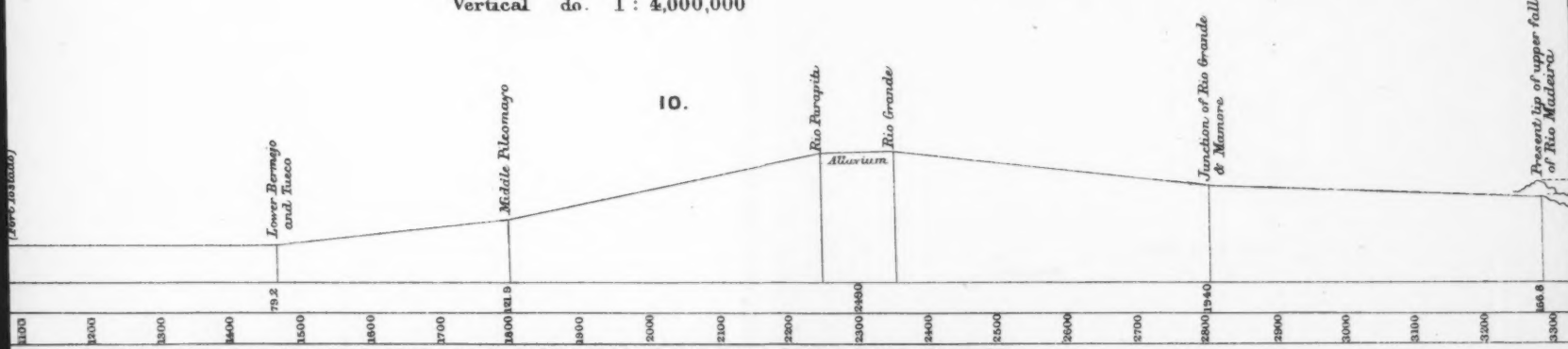


SOUTHERN RAILWAY FROM TEMPERLEY (near the City of Buenos Ayres) TO BAHIA BLAN

Horizontal Scale, 1 : 20,000
Vertical do. 1 : 4,000,000

10.



SECTION FROM THE ATLANTIC COAST OF BUENOS AYRES, TO THE FALLS OF THE RIVER MADEIRA.

Horizontal Scale, 1 : 12,000
Vertical do 1 8,750,000

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678

33

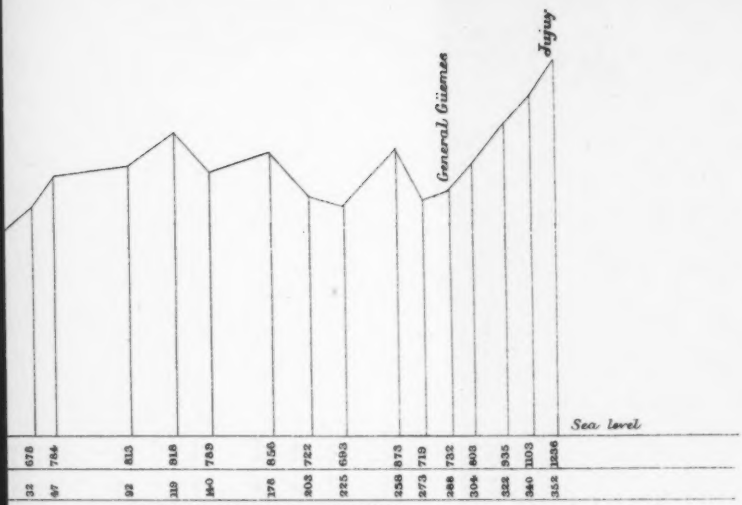
250

372

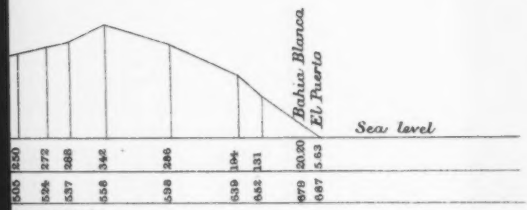
505

526

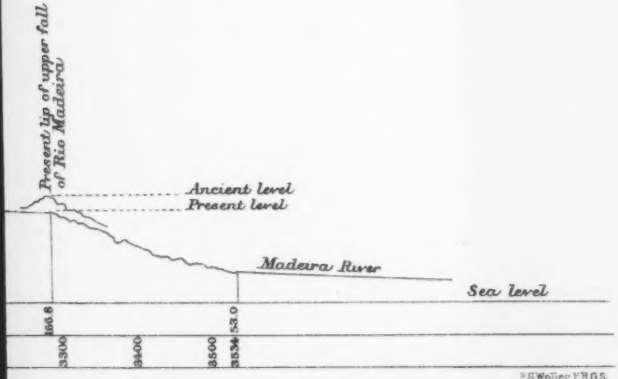
IA B



CENTRAL NORTHERN RAILWAY



IA BLANCA.



F.S.Weller F.R.G.S.